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THE AMERICAN ACADEMY OF RAILWAY SURGEONS

* * *

TRANSACTIONS OF THE FIFTH ANNUAL MEETING

HELD AT

CHICAGO, OCT. 5, 6 AND 7, 1898

* * *

EDITED BY

FRED J. HODGES, B.Sc., M.D.

ASHLAND, WIS.

* * *

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1899

THE HIGHER THE ORDER OF RAILWAY SURGERY THE GREATER THE PROTECTION TO THE EMPLOYE, THE PASSENGER AND THE COMPANY.

PREFACE.

It is with no small degree of satisfaction that this, the Fifth Volume of the Transactions of the American Academy of Railway Surgeons, is presented to its Fellows and the profession generally.

The character of the work presented in this volume and the possibilities for future development therein suggested, stamp the Academy as one of the *useful* professional bodies of the land.

The fact that a considerable number of Fellows of the Academy who had promised papers for the Chicago Meeting were at that time serving in important and exacting positions in the United States Army Medical Service explains the comparative shortness of the program.

THE EDITOR.

87660

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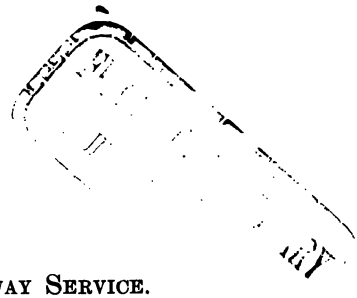


Chapter I.—Railway Service.

THE HIGHER THE ORDER OF RAILWAY SURGERY, THE GREATER THE PROTECTION TO THE EMPLOYE, THE PASSENGER AND THE COMPANY.

BY R. HARVEY REED, M.D.

Superintendent and Surgeon-in-charge, Wyoming General Hospital: President Wyoming State Medical Society; Assistant Surgeon Union Pacific Railway.

ROCK SPRINGS, WYO.

The deaths resulting from the slaughter and illness in the Spanish-American war, which has scarcely closed, saying nothing of the wounded and sick who will recover from their misfortunes, have enlisted the sympathy of every citizen of this, the greatest nation on the earth. Those who participated in this brief but decisive war would scarcely number more than 400,000 people, including the armies of both nations.

It is true, if we can place reliance in the reports made from time to time, that thousands have been killed and wounded, and tens of thousands have been ill from disease. Our papers, from the smallest sheet on the frontier to the greatest daily periodicals of the world, published in the metropolis of our nation, were filled from day to day with harassing accounts and heart-rending stories of the suffering and loss of life, the result of this short and most extraordinary combat. This great war was precipitated quite unexpectedly to the majority of the people of the country,

whose minds at that time were occupied with business transactions, but notwithstanding the thirty years of peace, our plowshares were turned into swords and our pruning-hooks into spears, and in the short space of four months war had been declared and all preparations for raising an army of over 200,000 men had been accomplished, and provisions made for the caring of their sick and wounded, and a proud, haughty enemy conquered.

If the reports of the daily press are to be relied upon, one is led to believe that the most complete preparations for the care of the sick and wounded have not been invariably at hand. Yet it seems strange that an educated people like those of the United States, and especially those who guide the pencil of the press, would expect in so short a time, with such circumscribed laws, to prepare a corps of surgeons who could show to the world the highest order of military surgery. Nevertheless, under these adverse circumstances, we believe, so far as our surgeons were concerned, and the facilities they had granted them by the laws of this country, they distinguished themselves as *well* as any other nation could have done in the short space of time allotted them under existing statutes.

In this connection, permit me to quote from one whose opinions are honored and respected where surgery is known, one who left a most prosperous professional practice, and for the love of his country and his profession, turned his back on his home and its comforts, and went to the very front, where he had an opportunity to witness the fiercest of the fight, and the most dire ravages of disease. I refer to Lieut.-

Col. N. Senn, U. S. V., Chief of the Operating Staff with the Army in the Field, who, in a paper published in the JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, Sept. 17, 1898, on page 655, says:

> The executive power of the Surgeon-General is indeed an exceedingly limited one. Everything of importance has to pass through the hands and by the sanction of the Secretary of War. The Secretary of War is a busy man in keeping track of what is going on in his department *outside* of the Surgeon General's office. On the other hand, the medical department *depends entirely* on the quartermaster's department in forwarding and distributing medical supplies. No wonder that many collisions between these departments occurred during the present war. Our experience has taught us in the most forcible way that the medical department should have charge of everything pertaining to the sick and wounded, in order to accomplish that for which it is intended.
>
> The Secretary of War is not supposed to have any knowledge of medicine or surgery, or other wants of the sick and wounded, and yet the Surgeon-General is powerless in the execution of *his orders* without his co-operation. If the forwarding and distribution of the medical and hospital supplies were directly under the control and management of the medical department we would have heard *less of well-founded complaints* of the scarcity of medicine and hospital supplies. To make a department strong and efficient, it must be independent.

I do not believe there is a member of the medical profession here today, and I might say I do not believe there is any member of the medical profession, who realizes the actual condition of the medical department of the United States Army, who can gainsay the remarks just quoted from Lieut.-Colonel Senn, and if these remarks are true in great armies, where their sole object is that of maiming and killing each other, then it certainly must hold true in any line of business where accidents may occur, in

which the surgeon must be relied upon in times of emergencies. Railroads, so far as their management is concerned, are very much the same as the army. It is just as essential to have the so-called red-tape in the successful management of railroads, as it is for that of a large body of troops on the field of battle. When we consider that the railroads of this country employ in round numbers about one million men, who, as a rule, are the very cream of the physical strength of our nation, and who are exposed daily to the dangers of a large variety of casualties, which may snuff out their life in the twinkling of an eye or maim one, the very picture of physical health, for life, we begin to realize the importance of the very highest order of surgery for the protection of the employes and passengers, not on the basis of humanity alone, but in the interest of the company which employs them. From the statistics of the railroads of the United States for 1897, compiled by the Interstate Commerce Commission, we find that for the year ending June 30, 1897, there were 43,168 casualties, 6437 of which resulted in death and 36,731 in injuries of varying characters.

In the recent war we learned the lesson that inadequate care, the result of inadequate laws, caused an *increase* in the suffering, simply because the medical department, instead of being independent and held responsible to the War Department for its acts, was dependent upon *non-professional* men for practically every need. Men who knew nothing of either medicine or surgery, of the laying out of camps, of the equipment of hospitals, of the furnishing of medical supplies, were the men whom the most skilled sur-

geons of this country were obliged to look to for orders for the care of the sick and wounded. I have maintained for years that the same holds good in railway surgery, and trust you will pardon me for quoting from a paper I read before the New York Medico-Legal Society, at the request of its secretary, June 14, 1893, in which I made the following statement:

It is to be regretted that a large majority of the railroad companies, and especially so on our eastern roads, leave the selection of surgeons to non-professional men; men who are not able to judge of the scientific qualifications of surgeons, but who, nevertheless, employ them to take these responsible positions, which often mean thousands of dollars to the company, without taking the precaution to ascertain their ability in advance, but usually appoint them through *friendship* rather than merit.

The idea of placing a surgeon under a non-professional man and expecting to get the best service out of him, is just as reasonable as it is to place over an attorney, who is trying a case before a jury, a judge, who knows nothing of law, and who was picked from the laity, and who might be a good gardener, a good horseman, or a fine singer, but who knows as little of the law and the conducting of a suit on trial as the "wharf rat" does of theology.

This, we regret to say, has been the status of railway surgery for years, and to a certain extent is the policy adopted by quite a number of railway companies today, which either place the surgical department under the control of the general manager or general superintendent, or, in some instances, the claim agent of the company. But notwithstanding all this, I have always had faith enough in humanity to believe that the time is coming when these errors will be righted, for I am sure the thinking, reasonable man, when it is once explained, will see how utterly impossible it is to get the best service out of a surgeon by placing him under the control of one who knows nothing about his business and has not the least practical appreciation of the services he has to perform. In comparison it would be just as reasonable to place a surgeon at the head

of the legal department and compel the corps of "Company Council" to abide by his judgment and decisions whether right or wrong, as it is to place the claim agent at the head of the surgical department, who must listen to his dictations in reference to the surgical service of the company they represent. Or again, it would be just as reasonable to place a surgeon at the head of the operating department of the railway company and expect him to manage that with success, simply because he was a good surgeon, as it would be to place a general superintendent over the surgical department and expect to get the best service possible from his surgical staff.

Young as I am, I am thankful that I have lived to see the majority of the leading and progressive railroads of this country make rapid strides toward the higher order of railway surgery, and I have every reason to believe they did it because it was a protection to the employe, the passenger and the company. We can not expect railway surgery to spring out of chaos, and like a mushroom, attain its full size and strength in a single night, any more than we can expect any other department of the railroad to develop to its highest point at a single bound. It has taken years for our railroads to develop from the wooden rail over which a few clumsy, uncomfortable, unsightly coaches were hauled by oxen, mules or horses, into the magnificent palaces drawn by engines of inconceivable power over tracks of the smoothest steel, at almost incomprehensible speed, which have lashed our continent from north to south and east to west, abolishing time and making travel a comfort, yea, even a luxury, rather than a drudgery. Likewise, it has taken time for the development of the surgical department, which most naturally has been looked upon by the operating department as a *necessary evil*

of which the less they had to do with it, the better. It is very easy for the writer to recall numerous conversations he had with different railroad operators relative to the advancement of railway surgery. It was amusing to hear some of them advance what they considered one of their strongest arguments, that the equipment of a railroad for the care of emergencies was prima facie evidence that it was in a condition in which accidents were most liable to occur and for that reason its operators had prepared for something they expected and thus would deter the public from traveling over their line. This, however, I am glad to say has gradually been eradicated from the minds of most of our progressive railway operators, for it has been demonstrated over and over again that the very best railroads, managed by officers of the highest skill and experience, are bound to meet with accidents. Notwithstanding the automatic coupler, the air brake, and the numerous minor improvements, we have had during the year 1897, as has already been mentioned, a whole army of more than forty-three regiments of 1000 men each injured in a single year, out of which more than six regiments of 1000 men each were killed outright, and more than thirty-six regiments of 1000 men each were the victims of injuries of varying severity. From these figures it would appear that it is important, notwithstanding the advancement of the railway management, that they be prepared for the inevitable, and by this I mean, that so long as railroads exist, emergencies are bound to arise and must be taken care of.

I believe it was on August 28, 1830, that the first railroad accident occurred, which consisted in an in-

jury to the thumb of one Peter Cooper, who was a master mechanic as well as an engineer, and who not only gained the distinction of having built the first railroad engine in America, and drawn the first passenger car in the world, but was the first railway employe to meet with an accident requiring surgical care. From that time to this, railway surgery has been gradually developing, and notwithstanding it has had many backsets, it today stands the peer of any other department of surgery in the world. There was, and we regret to say still continues, with some few roads, a time when a railroad surgeon, as an employe of the company, was unknown. A physician was simply called when an accident occurred, whoever was nearest, and the case was turned over to him without regard to future consideration, and when his bill came in it was paid, but oftentimes with deep-seated remorse on the part of the company. By and by, railway companies began to find out that this was an expensive method of operating that department of their road, for not only exorbitant bills were charged for incompetent services, for trivial accidents, by physicians thus employed, but exorbitant demands were made against the company for damages, frequently the result of incompetent surgical services rendered the employe or passenger, who, by the railroad company had been placed in the hands of an unskilled, inexperienced, and consequently, incompetent physician, for treatment. This, in time, led to the appointment of "company surgeons," who, in the early history of railway surgery, were under the direct control and guidance of superintendents or managers. This was an important improvement over

the former, but far from attaining the highest order of railway surgery.

Less than twenty years ago the first association of railway surgeons was organized, which had for its object the advancement and improvement of railway surgery. At that time such an office as Chief Surgeon was practically an "unknown quantity," and the now familiar "hospital system" was in its swaddling clothes, and it is less than ten years since the following resolution was offered by a prominent railway surgeon of Ohio, at a meeting of the Association of the Bee Line Surgeons, held at Cleveland:

> In our opinion the surgical service of the Bee Line Railroad will be much improved by sending to well-established hospitals the injured employes, there to be treated by the regularly appointed surgeons of the road.

The question of the importance of railway surgery has been agitated by local, district and national associations, which have met from year to year and discussed the good and the bad methods of treatment of emergencies arising from railway accidents. The question of railroads without a surgical corps has been thoroughly considered, and the result weighed in the balance of economy. Heterogeneous systems of different methods where company surgeons were appointed by the superintendent or manager were tried by the different railway companies of the country, all of which have been carefully scrutinized and their results in dollars and cents to the stockholders carefully compared, whilst the hospital system, which has been adopted by a large number of the greatest railway systems of the world, has been held up before the piercing eyes of the active railway surgeon, as

well as the advancing and observing manager or superintendent, and its merits thoroughly investigated.

During all these years, it has been the aim of the conscientious, active and experienced railway surgeon to ascertain from practical experience that method which will give the best service to the employe, the passenger and the company, for experience has taught him that these three factors were essential elements that cut a large financial figure, annually, and reduced the exchequer of every railway company. They realized that railway companies were not organized for philanthropic purposes, but on the contrary, were organized on purely business principles, and looked forward to a given amount of returns on a given investment with the least amount of expense and liabilities. From this standpoint, it is a logical sequence that a dollar saved is equal to a dollar earned, and while it has been found impossible to avoid the occurrence of accidents, the next best thing was to provide a method of caring for those who were injured by these accidents, not only in the most humane manner, but at the least expense and loss of time and permanent injury to the parties afflicted.

To accomplish this, I believe it is now beyond question and has been fully demonstrated by the leading and progressive railroads of this land, a majority, if not all of which, have hearkened to the advice of their railway surgeons, that in order to attain the highest order of professional service, it was not only necessary to have an independent department, under the management of a competent chief surgeon, but in addition a well-organized and economically conducted hospital system that is prepared at all times

to care for any class of injuries or illness that may occur in the operating of a railway system, with the least loss of time, the least permanent injury and the least expense, and the least suffering to the sick and wounded.

It seems a strange, but a happy coincidence, that at the close of the nineteenth century, not only the leading railway surgeons, but also the leading military surgeons, have, from experience, arrived at the same conclusion: that to make a department strong and efficient it must be independent.

PHYSICAL EXAMINATION OF RAILWAY MEN.

BY J. F. PRITCHARD, M.D.
SURGEON CHICAGO & NORTHWESTERN RAILWAY.
MANITOWOC, WIS.

When first making an investigation of this subject, about twelve years since, I was surprised to find its complete non-existence except in two systems of railway in which, for the purpose of insurance, examinations were made, but with no reference to service further than this might reach. In both instances there was then no examination made of vision or color perception. Gradually this has changed from an examination first made from a special train, and very hastily, until now, when a few railway systems employ competent examiners to make the tests; but I think there is yet great room for improvement. The recent examinations for service in the volunteer army demonstrated that there are many defective men, and if the temporary service in this war required such physical perfection, certainly the long and arduous service on a railway ought to require men of as perfect physical conformation as can be secured. This scarcely admits of argument.

The examinations that were first commenced by myself consisted only of eye tests for color and correct vision. At that time, on account of strikes and disturbances of all kinds, it was not deemed best to

attempt a full physical investigation of each man, but we soon found that the men considered the examination in its true light and understood that it was for their own good, quite as much as for the interest of the railway company. There were nearly twenty-five hundred cases examined of men then in the service or coming in during this period, of which about 2.5 per cent. were deficient in color sense and a less number had other defects of vision.

It always accorded with my observation that there was a special need for a very careful physical examination of men in this service, and great pains ought to be taken to prevent men with stiff joints, deformities from previous injuries or defects, either congenital or from disease, from entering the service. It would hardly be necessary to give instances of disaster in which such cases are neglected, but only to emphasize the fact of care being very needful in selecting examiners and the uselessness of any but medical men who have made the subject a study. Examinations should be made on carefully prepared blanks and not at haphazard. In other words, the medical part ought to have a definite set of questions covering all necessary points, thus making the record specific. I would also suggest that a complete set of Holmgren's worsted would give a better record of color sense than a partial one. And if these yarns are in the hands of properly instructed examiners they can not fail to give correct results. I have had my suspicions aroused in some cases that men are liable to learn the numbers or letters on the brass tags fastened to the skeins and thus wholly defeat the object of the examination. There should be but one

method of recording these color tests and regarding examinations for perfection of vision. The usual fraction as represented by the type read at twenty feet is always clear.

In this connection I would like to comment on a recent letter in the JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION. The writer evidently misunderstands the objects of examination. We do not attempt to make diagnosis of disease, nor is it required to examine the eye with an ophthalmoscope, but we want to know if he can see the proper color correctly and is able to see clearly at a distance. The old employes on railways are allowed to wear glasses and have any defects corrected by such artificial means as they can obtain. There is no intent on the part of the company to cause any hardship, but the design is merely to protect the public and themselves. These examinations can be made, however, by others than oculists and be quite satisfactory. We have used for years complete sets of Holmgren's worsted, and later, a modified set. I would also say that we require a matching and under no circumstances a naming, of color. As to repeated examinations, these are only necessary when the men give evidence of disease, and then they are very likely to consult proper medical counsel. As to new men for service, under no circumstances should they be accepted unless they are free from all defects. There is no sentiment in such case, no consideration for past services, but the idea is that of selecting the best only.

I have ventured to make a blank for examinations that is intended to cover some of the deficiencies of our present one and to meet the necessary require-

ments, as I find the tendency of examining surgeons to answer no questions unless specifically stated.

SURGEON'S CERTIFICATE.

In examination of . . . (Applicant should write his name here.) . . . for service in . . . Railway Co. as . . .

Height, . . . ft. . . . in. Weight, . . . lbs. Rate and character of pulse . . . Is he deformed or maimed in any manner? Give particulars . . . Are his defects from disease or accident? . . . Is he a pensioner? If so, for what cause and how much pension per month is he receiving? . . . Has he any disease either of brain, nervous system, chest, including heart and lungs, abdominal organs, skin, ears, eyes, joints or muscular system? . . . Examine each eye separately with Snellen's test type and give results for right eye . . . left eye . . . both eyes . . . Examine with Holmgren's yarns and give his vision for red . . . blue . . . green . . . rose . . . yellow . . . State distance in inches at which he can hear the tick of watch. Right ear . . . inches; left ear inches. Can hear ordinary conversation at . . . feet. Do you recommend him for service in this company? . . . If not, give reasons . . . Signed . . . , Surgeon.

In the first place the man should sign his name in the presence of the examiner as a needed identification. His general appearance as to health and habits is very important, as the trained eye of the surgeon can oftentimes judge as to his fitness by this means alone. And in a general way the man should be examined on a plan somewhat after the manner of that used in military service. A glance at the naked figure will give much information otherwise not obtainable. Particular attention is in this manner called to deformities and defects. Hernias are easily seen. Varices and other diseases become at once matters of record.

In the examination of the eyes I much prefer a full set of the usual worsteds and an avoidance of tags and

numbers, for the reason that some examinations that have come into my hands show too much of a similarity of one man with another, so much so, in fact, that they might have been copied continuously. At my directions the following instructions were sent out to examiners by the general superintendent *of one system:*

In addition to the questions to be answered in the blank the following rules for examination should be observed:

DEFECTS THAT DISQUALIFY.

1. The wearing of glasses in railway service applies only to old men in the service. Under no circumstances should new applicants be admitted who have defects requiring the use of glasses. Examine men who have been long in the service with proper glasses if necessary, and if they have not been fitted so as to have proper vision they should be before continuing their occupation.

2. Examine carefully, noting defects or disease, such as those afflicted with paralysis, epilepsy, any defects of mental powers, also emaciation, if present, from what caused, habitual cough, disease of lungs, stomach, bowels or kidneys.

3. Note such defects as hernia, lameness, loss of hand or foot or any part thereof, or any deformity; also note character of pulse, whether intermittent or not; and whether the examinee is afflicted with chronic ulcers or open sores.

4. Note the general appearance of applicant, as to his habits, whether dissipated or not, and if he appears to be healthy or otherwise.

If in the examination of men already in the service you find any particular symptom or indication which you are in doubt about, or which on rigid adherence to the rules laid down would be sufficient to lead you to recommend his dismissal or the change of employment, please make a special communication to me (the general superintendent) on the subject, but do not let it appear in your examination, as we desire to be as lenient as possible with our old employes, so far as is consistent with safety.

Now, I have the further suggestion in closing, viz., that all of this work should be reviewed and passed upon by a chief surgeon before going to the operating department of the railway company. The plan now in use is, when there is urgent need, for the man to be put at work on probation, pending his report. But I find in some quarters there is no report ever made to the superintendent, and as a consequence he is left entirely to his own resources. This should be remedied, and it can be very easily by merely sending reports to the head of the surgical department and let him check them. This will soon overcome any tendency to carelessness on the part of examiners and result only in the good of the service.

DISCUSSION.

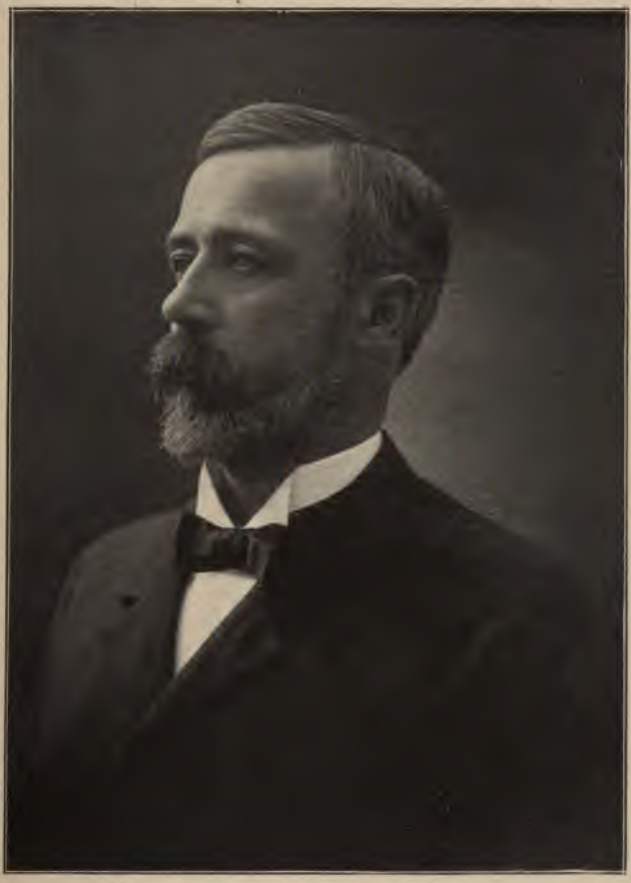
Dr. T. B. LACEY of Council Bluffs, Iowa—It occurs to me, having had experience along the lines mentioned in Dr. Pritchard's paper, that it would be difficult to take issue with him with reference to the position assumed in his paper. I am fully in sympathy with him. The proposed employe of a railway company should be in good physical condition and in full possession of his special senses, especially sight and hearing. He should be in such condition as to insure the safety of passenger, employe and property. There can be no question that an employe should be able to distinguish different colors, the import being that he will distinguish colored lights that are used on switches at night and light signals that may be given. This enables him not only to protect the passengers on the trains of the railroad company, but it is a protection to the individual himself, because it is easy to conceive how and why an employe who is color-blind might perhaps lose his own life as a result of that condition, and he needs all the special senses.

The Doctor spoke of the watch test and of the distance at which the tick should be heard. Personally, I do not like the watch test, for the reason that if we take the watches we will

find no two of them will tick with the same degree of distinctness or loudness. Of course, I realize that the watch test is universally employed in making these examinations, and you have a person apparently on your paper that would come up to the standard, but your standard is not perfect; it is not equal in any respect. It occurs to me that the only reliable test is that of an ordinary conversation. This can be tried on each ear just as well as the watch test. There can be no question whatever as to the condition in which a man should be physically. I know from personal experience that an employe with an imperfect hand, whether it be from disease or from accident, is much more liable to injury in coupling cars than one having a perfect hand. We know, too, there is a greater liability to injury if there is a deformity of the foot or of the limbs, or any disease existing which practically interferes with good and rapid locomotion. If a ruptured individual is required to perform a certain act that must be done quickly and certainly, the exertion may bring down the gut, even if a truss is worn, and the resulting intense pain may render him unable to complete the movement undertaken. Consequently there is a large element of danger in all these cases. The roads that do not require some form of physical examination for proposed employes are losing sight of their own interests.

Dr. W. L. Smith of Streator, Ill.—In regard to the watch test, I think if you have your own watch and make a comparison between the men and yourself how far you can hear the tick of the watch, you can very nearly ascertain the correct distance of hearing. I use a stop watch, the same kind of watch that race track men use, and I find it is much better than the ordinary watch that we carry around. As to examinations of the eye and for color, etc., I believe these examinations should be as thorough as those for the military service. I have helped to examine probably eighteen thousand men within the last six months, and we used the letter test. If a man has good vision in the right eye and in the left half vision, he is allowed to pass, but I do not believe that that is sufficient for railway service.

Another condition not spoken of in the paper, and one of great importance to railway companies, is flat-foot. A man with such a deformity should be disqualified from entering the



J. F. PRITCHARD, M.D., First Vice-President.

railway service. The average switchman does as much walking in a day as an ordinary soldier, and if he has flat-foot, his feet give way, and it is the cause of many accidents.

Dr. D. S. FAIRCHILD of Clinton, Iowa—I quite agree with the essayist as to the examination of railway employes, and I am quite in accord with the proposition to give the examining surgeon a certain amount of latitude in conducting those examinations. It is difficult or impossible for the examining surgeon to secure the best class of men outside of answering categorically a series of questions given by the examiner. These examinations for the railway companies should be placed in the hands of those in whose opinions they have entire confidence, even if they are not always conveniently located. It may happen that at headquarters men are not thoroughly competent to make these examinations, and if this be true, they should be conducted by some one not at the headquarters, but one who is competent to do the work. In the last four years I have examined four hundred men for employment on railroads, and I have found that curious things would crop up. As to color-blindness, I find that in mixing the colors great confusion would be created, and after several subsequent trials the men would be able to make a proper selection of the colors. And so it is difficult to determine always whether a man is really color-blind, or color-ignorant. I have a case in mind of a man who a year ago came for examination and was rejected because of color-blindness. At least, I thought he was color-blind. He appeared at the office recently, I examined him again, he confused the colors, and was again rejected. He asked for further examination, came to the office, and after several trials he was able to pick out colors properly. I had suspected that the man had learned the figures on the pads, and I gave him a period of probation, giving him to understand that he was all right, but I did not make out his final report. A month later I sent for him again to come to the office and go through an examination with the colors, and I watched particularly that he should not be able to see the numbers on the tags, and he picked out the colors correctly without hesitation. The carefulness with which I watched him, and the length of time which had elapsed, convinced me that the man had actually learned the colors, and that at first he was not really col-

or-blind, but color-ignorant. Instances of this kind will come under our observation, and I have become convinced, after two or three similar observations, that it is difficult for the examiner to determine whether a man is color-blind or color-ignorant. I have treated all these cases as color-blind, permitting the applicants for railway service to appear for re-examination, advising them during the interval to study the colors, to learn them as well as they could before appearing the second time, and I have found some of them were able to pick out the colors properly.

In regard to the test for hearing, it is not altogether a question of whether an individual can hear properly at the time of the examination, but I am told by aurists that the tick of the watch is the best test as to the condition of disease. An individual may appear for examination and hear a watch only two or three inches distant, yet he hears conversation well at twenty feet, and this would not disqualify him. The question comes up whether or not failure to hear a watch tick at a certain distance does not indicate some aural disease which is going to become more serious and make the man very deaf in the future. I have no personal knowledge of this matter, but I have been told so by gentlemen who have given this subject special attention.

Dr. M. GARDNER of San Francisco, Cal.—I am very glad to have heard this paper, and it ought to be placed in the hands of every chief surgeon of a railroad. In our own company we have been making physical examinations for four years. During the last year, up to June 30, the number of examinations made was 2294. Of this number only 62 per cent. passed perfect examinations. They were mostly of about 45 years of age; 18 per cent. were imperfect, but still not sufficiently so to disqualify them from entering the service, and 20 per cent. were rejected. Of this number we rejected 3.5 per cent. for color-blindness; 4 per cent. for hearing, and 2.5 per cent. for distant reading vision. We go a little further in our examinations than anyone has mentioned today. For instance, we insist on distance vision examinations all the way from 20 to 1000 feet. A man is supposed to see a signal light distinctly at a thousand feet. He is also supposed to see No. 20 test type, on standing, at 20 feet. We further examine them as to reading vision at

14 inches. Every engineer reads his orders at fourteen inches without glasses.

In regard to examinations for colors, a man who is color ignorant ought to be rejected. A man who is also ignorant enough not to call colors when he sees them, ought to be rejected. So we treat such men on the same grounds.

As to age, we accept none over 50, and this year will terminate that by reducing the age limit to 45 years. In our physical tests we have rejected train operators, flagmen, switchmen, and yardmen. As to hernia, varicocele, heart trouble, and deformities, we reject fully 10 per cent. in our physical examinations. We accept a hernia after two years' standing. In the case of varicocele we accept a man as soon as he is able to leave the hospital. We do not allow our surgeons to operate on a man who has been rejected after a physical examination, as a matter of policy. As to hearing, we furnish our own watches. I select them; we use the ordinary nickel-plated stop watch. These watches are furnished to all surgeons on the roads with which to make their examinations, so they are all alike. We furnish every surgeon with a supply of the tests with which to make examinations, from one end of the line to the other. We have twenty men to make the examinations.

I recall an instance in the southern part of our system where the examiner failed to strip the applicant, something which we insist on. The man pushed his pants down, and did not take them off, the pants covering a bad ununited Pott's fracture. I recall another case in which a man had an artificial foot, covering it up by pushing his pants down. I simply mention these cases to show you what men will resort to in order to get in the employ of railroad companies.

Of the 2294 cases that were examined last year, we rejected 441 for all causes. We rejected 4.19 per cent. for distant vision, 2 per cent. for errors of refraction, 2.6 per cent. on account of not being able to read at fourteen inches, for defective hearing 5.98 per cent., color sense 3.5 per cent., and for general condition about 10 per cent. Nearly all the men were under 30 years of age.

In making physical examinations we have printed rules and regulations which we furnish to everyone. We insist on having applicants stripped. We take no chances on anything.

Each applicant has to undergo a thorough physical examination; if he is under weight, we will reject him. We want able, sound men. The number of surgical cases on the Southern Pacific lines has materially diminished in the last three years as the result of the solid, sound men we have admitted.

2 M 30

S.P.CO.—Pacific System. DUPLICATE CERTIFICATE. No.....

Examination of..... 189.....

Age	Nativity	Employed as	Applicant for Position as	At

EMPLOYEES AND APPLICANTS.

1ST TEST.—DISTANCE VISION. 20 FT.

Right Eye=20 Left Eye=20

2D TEST.—REFRACTION. 20 FT.

Right Eye ..... Left Eye.....

3D TEST.—READING VISION 14 IN.

Right Eye..... Left Eye.....

4TH TEST.—FIELD OF VISION. 3 FT.

.....

5TH TEST.—HEARING.

Right Ear:—With Watch 60 Left Ear:—With Watch 60

6TH TEST.—COLOR SENSE.

To Match Green skein..... To match Red skein .....

" Pink " ..... " Blue " .....

With Signal Flags and Lanterns.....

.....

7TH TEST.—GENERAL CONDITION.

a. Is there evidence of organic or functional disease of any organ? If so, what?

.....

b. Is there evidence of local or constitutional (specific or non-specific) disease? If so, what?.....

c. Is there any deformity, congenital or acquired? If so, what? and when and where acquired?.....

.....

d. Is there evidence of being addicted to stimulants or narcotics? If so, what?

.....

e. Note here anything abnormal not specified above.....

.....

APPLICANTS ONLY.—Is ..... up to standard in ..... Tests and is .....

.....M. D.

(FOR CHIEF SURGEON.) (OVER)

Dr. D. C. BRYANT of Omaha, Neb.—This paper has brought up some interesting points. The question of an applicant being examined by some one he knows or by some one he does not know is of more importance than one would think at first. In examining employes for the Union Pacific Railroad, I have been called upon to examine a great many strangers. I have

had men who were strong, physical athletes, come into the office for examination. Shortly after placing the color skeins before them and having them sit down to watch the colors, the perspiration would roll off their faces, and they would appear to be very much frightened and often confused about the col-

2 M 20

S. P. CO.—Pacific System. CERTIFICATE OF EXAMINATION. No.....

Examination of ..... 189.....

Age	Nativity	Employed as	Applicant for Position as	At

EMPLOYEES AND APPLICANTS.

1ST TEST.—DISTANCE VISION. 20 FT.
Right Eye—20 Left Eye—20

2D TEST.—REFRACTION. 20 FT.
Right Eye..... Left Eye.....

3D TEST.—READING VISION. 14 IN.
Right Eye .. Left Eye

4TH TEST.—FIELD OF VISION. 3 FT.
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5TH TEST.—HEARING
Right Ear:—With Watch 60 Left Ear:—With Watch 60

6TH TEST.—COLOR-SENSE.
To match Green skein ..... To match Red skein .....
" Pink " ..... " Blue " .....
With Signal Flags and Lanterns .....
.....

7TH TEST.—GENERAL CONDITION.
(Give Synopsis) .....
.....

APPLICANTS ONLY.

This applicant has ..... come up to standard required by the Company in ..... Tests, and on that account is .....

This is to Certify. That above named party has this day presented himself for examination, under properly signed permit; that I have made such examination in a careful and thorough manner, and in accordance with Company's instructions; and that the information herein contained, so far as I have been able to discover from my examination and his replies to me, is correct.

.....M. D.

Examiner at .....

FOR OFFICIAL ISSUING PERMIT. (OVER)

ors. Now, the boys that live in Omaha and who are acquainted with me, come to my office and pass the same examination without any trouble, without any sweating. Examinations with the color skeins are not a great success. In my own office I have a dark room in which I can test applicants with different colored lights. If an applicant fails with the colored

skeins, I take him into the dark-room and use a flashlight, such as he would be required to use in his work, and I can then determine whether he is color-blind or not; whether he can distinguish green, red, blue, and white, as he should be able to do in his work. Many of the applicants for railway service that we at first suspect to be color-blind are not. After passing an examination in the dark-room, and the excitement has subsided, these applicants will match the skeins without much trouble. If I understood the Doctor correctly, he stated in his paper that the old employes were allowed to wear glasses for distance.

Dr. PRITCHARD—Yes, sir.

Dr. BRYANT—I think that is a mistake on the part of the company. If an employe has an error of refraction, if he has 2D. of hypermetropia, he is a much better man before he at tains the age of 40 years than he is after that age. Before he attains 40 years of age his accommodation is good; he can overcome 1D or 2D. of hypermetropia and have good vision for distance. After this age he loses the power of accommodation, and his vision for distance becomes poorer and poorer.

Speaking of trainmen, I do not believe any man should be allowed to use glasses. If his vision is not good for distance, he should be given some other employment in the service. Of course, men who have been in the employ of railroad companies for years should be treated well. Reading orders is a different thing. An engineer can use his glasses for this purpose, and then remove them; at the same time, if the distant vision of an engineer is poor, not knowing how soon he may break his glasses, or how soon they may get frosted or dusty, it becomes poorer, and a wreck may result in consequence of it. Such men should be taken off the train service and put in some other branch. The rule of the railroad represented by Dr. Gardner, of not employing men for train service after they have reached the age of 45 years is better still.

In considering the question of hearing, I believe the watch test is the best of all for one portion of the test, but we should not stop with the watch test. The average watch tick gives us a high tone. Many applicants for positions in the railway service can hear high tones, but not low ones. Let them be

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thoroughly tested with the watch, the voice, and the tuning fork. I give them a fair range. I do not take every tone in the gamut; but you will find many men who hear high tones, but not low ones, and vice versa. This usually means that there is beginning trouble in the internal ear, and this is a serious matter. An applicant who is examined today and hears distinctly high pitched tones, in six months may be unfit to enter the railway service. Railway employes should be examined at least once a year, and should not be let go until some accident occurs, and then be re-examined. No employe should be considered to be perfect next year because he is this year. He should be examined yearly, especially as to sight and hearing.

Dr. D. S. FAIRCHILD of Clinton, Iowa—The limit of the Chicago & Northwestern road for men entering the train service is 27 years of age. The question which I raised in my previous remarks, and which Dr. Bryant partly answered, was with reference to men not hearing a watch tick at a certain distance who were under 27 years of age. We know that there are men engaged in machine shops and boiler shops who are accustomed to noises for a long time, and it is impossible for them to hear a watch tick, yet they can hear ordinary conversation well. I refer to men who are not exposed to such noises, who are under 27 years of age, but who may have a mild form of internal ear disease which may give rise to serious results later on.

There is one other point. The Northwestern Railroad Company has adopted a system of examining engineers over 50 years of age. As soon as a man reaches that age his eyes are examined. There are only a few of them whose eyes are normal. Occasionally an engineer will be found with vision of $^{20}/_{20}$ who is 50 years of age. If the vision of these men, after reaching this age, is below $^{20}/_{30}$, then they are required to wear glasses.

Soon after I undertook the examination of these men, and they began to wear glasses, they told me that at night they could not see as well with glasses as they could in the daytime. Contrary to the instructions of the chief medical officer of the company, I advised the men to take off their glasses at night. After a while I had to wear glasses, and I had a

practical demonstration of it myself. I always take off my glasses at night because I can not see as well. We can not discharge engineers over 50 years of age whose eyes are slightly defective. Those are the men who are usually in charge of our passenger trains. I am inclined to believe that we should make some allowance for these slight defects. We should consider the intellectual capacity of these men. We find men who will pass an excellent physical examination, yet who are intellectually incapable of taking the responsibilities of trainmen; and we find men who are slightly defective in vision, and are bright intellectually. I am inclined to stretch a point in the cases of such men. Their intellectual caliber makes them valuable, and they are better able to assume responsibility. They make better men than those whose eyesight is perfect, but who are intellectually inferior.

Dr. R. HARVEY REED of Rock Springs, Wyo.—I am very glad I have been here this morning to listen to this interesting discussion and the instructive paper. The question of physical examinations of railroad employes has been discussed more or less by the different roads of the East, but to the best of my knowledge with no such thoroughness as it has been by western men. It is a subject which should interest the management of every railroad, because it is a protection not only to the employes, but to the passenger and the company.

The service inaugurated by Dr. Gardner on the Southern Pacific road is a practical innovation, and I think every trunk line ought to have most carefully selected employes, and such as we only get by careful examinations, as has been suggested by the author of the paper, and by those who have participated in the discussion. I think it is an innovation which should be pursued by the management of railroads in such a way that they will realize the benefits of it, and if our discussions in this Academy accomplish this one thing only, the year will have been profitable.

Dr. PRITCHARD (closing the discussion)—I feel very much gratified to have had this subject so thoroughly discussed, and have but little to note in my closing remarks. As Dr. Fairchild has told us, the C. & N. W. vision standard is 20/20 for new men under all circumstances. As to the watch test, there is nothing more practical in my opinion. We can not furnish

tuning-forks. If we do that, they must be of one pitch. The watch test, with ordinary conversation at twenty feet, will cover the question of hearing in a practical way, and there is very little more needed.

One of the speakers referred to passing a man with flat-foot. Any man who would pass an applicant with flat-foot ought not to be an examiner for a single moment.

There is one point that has occurred to my mind very often, and probably to the rest of you, and that is, that there should be a standard as to colored lights. Railroads oftentimes have all shades of red, from a dark to a bright red, in use at one time. I have had men select colors according to intensity, and this was the only way by which they could understand signals at all. I had one peculiar case quite recently. A man was referred to me for examination who had been a station agent for about fifteen or eighteen years. He turned his red light after the train had passed, went home and left it, and stopped all trains for that night. The question of distinguishing colors came up, and he was referred to me for examination. I found him so near-sighted that he could not see anything at two inches from him, and could not even be fitted with glasses to improve his vision. Such men need to be weeded out of the railway service.

A very important point is to see that all reports are sent to a competent surgeon to check over before they go to the operating department. When this is not done, great confusion results.

THE PREVENTION OF RAILROAD ACCIDENTS DUE TO THE PERSONAL EQUATION.

BY NORMAN BRIDGE, A.M., M.D.
LOS ANGELES, CAL.

Can some railroad and other accidents affecting human life, due to personal error or miscalculation, and heretofore mysterious, be explained by the constitution of the human mind? If they can be so explained, they are to some extent preventable.

By other accidents than those of railroads I mean such as occur in the work of drivers, telegraphers, pilots and surgeons. The reasoning that applies to the one applies to the other.

When we consider the nature of railroad accidents we discover them to fall into a natural classification. First are those due to defective material, as broken wheels, rods, bridges, viaducts, etc., bursting boilers, and defective brakes. Next are those due to the elements and the earth, as from the sinking of tracks, the washing away of bridges; from ice, snow, freshets, storms, winds and fire. Last, and most interesting of all, are those due to what may be called the personal equation. These fall into two or three sub-classes. First are those due to failure of deliberate judgment, as miscalculation of materials in bridges, misjudgment of the force of motive power and resisting power and the like. Second are those due to sudden loss of self-control on the part of operatives, from fright, excite-

ment, from panic and nervous stampeding, also from intense preoccupation in an accidental situation. The train breaks down, and in the excitement both conductor and brakeman forget about putting signals on the track to the rear of the train, and so a rear-end collision results. Third are those accidents due to absent-mindedness—the lack of mental attention to the thing in hand when the thing is important. A man leaves a switch turned wrong from this cause, forgets to put out the proper signal, and trains collide. An engineer runs past a signal to stop, and a collision occurs like that in Kansas recently. A man has in mind for an hour, and pays strict attention to the thought, that he must flag an approaching train, and then forgets to do it. There is no impeaching of the intentions and honor of the operatives in these cases. The engineer who missed the signal was killed, and life was as precious to him as to other men.

It is this last variety of accidents and the mental state that leads to them that will be mainly considered here. All the other classes of calamities are measurably manageable, or rather they can be calculated, at least they can be understood; even those due to sudden stampeding are not difficult of explanation, and something can be done, and much has been done, to prevent them.

The cases due to absent-mindedness are the most perplexing; they constitute a class little understood, always uncertain, never to be predicted or calculated upon in the slightest degree. The basis of the likelihood of their happening has seemed to be be an unknown quantity, and we are left to deplore a helplessness to correct them.

Whenever a calamity occurs we are aghast with amazement and wonder, and resolve that everybody must thereafter be very careful to the end that such accidents shall not recur. To those who stand aghast, the accident does not occur again, at least while their amazement lasts; but the rest of the world is quite uninfluenced by the calamity.

The greatest care on the part of railroad managers seems to have failed to eliminate this mental element from railroad operations. Numerous checks of great value have been instituted whereby two or three persons must take part in many acts and transactions leading to a possible accident, as in the nature of the reception and execution of telegraphic orders for the movement of trains. But the flagman stands alone —nobody keeps watch to check him if he forgets, nor very much the engineer while actually running his train, nor the brakeman putting out his signal, nor the switchman, nor always the train dispatcher. These men, to a degree, work alone, and at any time a moment of forgetfulness, confusion or absent-mindedness may lead to a calamity. How to eliminate this danger is a problem—a problem doubtless incapable of complete solution ever.

If there was some way of knowing who are more and who less likely to be seized with such a wave of mental abstraction it would be something, or if we knew under exactly what circumstances such lapses are likely to occur to any man, that would help greatly. The startling thing is that such lapses often come to the oldest, most sedate and correct and most tried and trusted employes, and at times when there is not the slightest reason to doubt their usual efficiency, when

they are neither sick nor tired nor overworked, nor disturbed by any distracting influence which their fellows know about.

Some things we do know bearing on this question: for example, distracting the attention of the engineer or motorman is liable to lead him into trouble, and so passengers are forbidden to ride with the one or talk with the other. The common dangers of being confused by too many distracting duties or influences is well enough understood and is guarded against as far as possible by protection from interruption, short hours and opportunity for rest. Constant mental attention with absolute singleness of purpose to the thing in hand is evidently the supreme desideratum. But frequently influences creep in that can not be barred out by any rules—that the individual himself perhaps could not prevent—as for example, personal worries, physical discomforts, and emotional disturbances of various kinds. One waft through the mind of jealousy or envy, one personal pique to worry about may break fatally into any systematic mental action and completely derail the attention. One fit of indigestion, especially if it causes despondency of mind, will kill all reliable mental attention. A man so afflicted will read a page of a book and ten minutes later be unable to tell a thing it contained; he would in that mood be an unsafe engineer. Every physician sees repeated cases of people with this sort of mental abstraction so serious that they seek advice for it. They think they are losing their minds and all that; they notice that they forget and worry and are easily upset and nonplussed. They may have indisposition or other bodily disorder that produces the

worry in part; but worry may aggravate the bodily disorder, and so each phase of the trouble accentuates the other. Many of these patients know they are unfit for business, and abstention from business is often prescribed for them. But from this extreme degree of trouble to the normal type of men there are all gradations of disorder, and many of the milder cases are going on with their work, whatever it is, and nobody supposes them to be abnormal. They are making all sorts and shades of mistakes with every variety of consequences.

There is another cause of such lapses of attention as lead to accidents, which is substantially never thought of, and it occurs to men who are in perfect physical health and have no unavoidable worries. It is the very expertness, and the perfection of mastery a man has in the expert thing or the responsible duty he has to do. Great familiarity with such a duty, expertness and deftness in the performance, become dangerous to that mental attention to the thing in hand that is so necessary. So, quickness and ease of learning become a danger rather than a benefit. A telegraph operator who learned the business very easily, was a phenomenal operator, could, so to speak, do his work without thinking, and for years had never made an error, one day, as a train dispatcher, confused the names of stations and produced a collision.

Any careful consideration of this subject must show the indispensable importance of mental attention to any expert work or responsibility. Failure of attention to the details leads to the accident or loss. The attention must be constant. In the various industries of life this is important, and most so where

one acts for others and especially for many; where, in case of failure, the injury would be widespread. Those are what may be not unfitly called "hazard or danger-duties." How to secure constant attention to these is the supreme question. What makes or will make the attention to the important thing in hand always alert? What leads it to flag? The subject on which we wish to fix and keep the attention is only one of many impressions coming into the mind and already in it. How may all other thoughts be thrown to the background and kept there till the task is over?

The subject is a large one. When the act is new and novel and has to be learned, is being learned, and there are pride and interest in acquiring it, attention may be constant for a long time; but finally the interest often flags and falls from fatigue. A sense of responsibility helps to keep it up, but as the maneuver becomes familiar less attention is required to do it and so less is given, and there is a chance for the attention to be fixed on other things, and so in grave matters there is danger. As long as the awfulness of the duty—the omission of which may kill—is kept fresh in the mind there *is* no omission; the duty is done to the letter. But the average man can not perpetually keep his mind keyed up to this pitch during his hours on duty. The awful duty will grow less awful by repetition. We can walk and think; we could not always do this, but every successive step had to be thought of and directed. Not having to think of the steps of our walking we may think of all sorts of subjects and walk as well. If one can walk and think independently then an expert can run

a locomotive, and much of the time, not all the time, think intently of other things—men sometimes do this and miss signals and forget orders and so a crash comes. The Kansas case of recent date was evidently one of this sort.

The more automatic, that is the more perfect, the man becomes in his special task, the more likely is he therein and thereby to have mental abstractions and so forget and blunder. If this task were one that could be trusted solely to his automatism, like a complicated piece of music that one becomes artistically mechanic in executing and that should be done every time in exactly the same way, the automatism might be trusted, but unfortunately, the railroad operative has always to use some judgment and sense and watchfulness with his automatism, for the situations daily vary a little, if only a little, and here is where he sometimes fails. And, other things being equal, the more perfect his automatism and the more oft repetition has taught him that the act is a matter of course the more familiar he is with it, the more likely he is to be the victim of abstractions and absent-mindedness. If he has other things on his mind or is given to day dreaming, he is always in danger of forgetting. So, awful a thing as it seems to say, the oldest, most trusted and by the records, the most reliable, employe may be, and often is, more likely to bring on a frightful accident than the youngest one who has attained the same service and rank.

The capacity to learn rapidly, to be deft easily, is a dangerous gift; for it reduces the need of attention to the task and increases the facility with which two combinations of thought can be carried on in the

mind at the same time. The most treacherous exercise of all is to think of two things at once when the one is vital; the only safe course is to think constantly of the one vital thing. There are more fortunate gifts than mental quickness and precocity, and one of them sometimes is mental slowness. That man, chagrined at his dulness, is lucky with fate, who learns slowly to be an expert, for then he acquires the habit of close mental attention to the thing in hand and the thing that he is charged with. To him the habit is more likely to stay after the act has become automatic, and so he may be spared a calamity from absent-mindedness.

Probably no class in the community are more obnoxious to this misfortune than doctors. Efforts to carry on at the same time two lines of thought have led them to errors in prescription writing and to blunders in surgery that would be more amusing if they were less destructive of life. But the surgeon whose blunders are likely to be most fatal is often saved by the fact that hardly two of his operations are exactly alike; he is most apt to slip in those manipulations that are most similar, when his hands may most nearly act without his thinking.

What remedy can be offered for the difficulties here outlined? For some of the dangers to railroad employes that have been referred to there is evidently one course that will eliminate to a considerable degree the danger from too much familiarity with the occupation, or too much expertness. That is occasionally and systematically to lay off old and quick employes or give them other kinds of work for stated periods, so that they may come back to their *danger duties* a

trifle strange to them, and therefore obliged to exercise more constant and steady attention. The novelty and strangeness will, as long as they last, tend to keep other thoughts than the vital ones in abeyance, and so the safety will be enhanced. It is matter for regret that statistics have not been gathered to show whether men coming back to their work from absences of variable periods are more or less liable to blunders than similar operatives who have been continuously at their work. I have no doubt that such statistics would show that the vacations are protective.

I am aware that such a proposition as is here made will strike the average railroad manager as absurd, and the faithful operators might easily consider it an affront to their efficiency and good intentions. Rut the managers have not succeeded in curtailing much the class of accidents under discussion, nor are they likely to succeed by methods heretofore in use, for the constitution of the human mind will not change, nor can we hope that its limitations will vary much with any amount of effort. And to say that a man's capacity for mental attention should be rested at intervals, if it has been overworked is no more an insult to him than to say he should rest his body by repose and his whole brain by sleep. Our difficulty over the question is due to the novelty of it. The daily need of sleep is an axiom every human being has proven experimentally. Many have proven that short hours and occasional vacations renew and increase one's capacity for mental labor of the highest sort; and two-thirds of the gain is always in the resting of the faculty—if it may be called a faculty—of mental attention. Why then should it seem strange that bene-

fit would come of a resting of this faculty, overworked and fatigued in occupations of less purely intellectual kinds?

DISCUSSION.

Dr. W. W. GRANT of Denver, Colo.—Mr. President, this paper is one of the most suggestive, one of the most instructive, and one that has in it a very broad basis for future good. Certainly, I have never listened to a contribution that should more generally attract the attention of the profession, not alone of railway surgeons and neurologists, but of corporations and the profession generally. I say suggestive, because in a measure the ideas advanced and the remedies adduced are somewhat in the nature of an experiment, yet I have no doubt that it will prove of infinite benefit to railroads and the traveling public. The subject is very abstruse, in that it largely deals with psychology. It accentuates the necessity, which is being recognized now by all railroads, of the physical examination of employes for any position in their service, from a brakeman to a conductor. It will convey the additional idea to railroad men that there is a mental side to the question which will be of the utmost importance for railroads to consider in the employment of men. In the first place, they should possess as near as possible, a perfect physical and mental equilibrium. The influence of habit upon men holding responsible positions and having important duties to perform, is one of the practical points in this paper. We know that professional men, and laborers too, become accustomed to do certain things in a certain way, and that they become thoughtless in reference to it because it is done almost automatically. The same is true of all occupations. The Doctor emphasizes in his paper the valuable truth that a man can not for a moment neglect his duty, or permit lapses, without endangering more or less the lives of those who are in his charge at the time. The matter of habit is one that has more influence with men in the discharge of their duties than people are disposed to think. I have no doubt that when this subject is properly considered, it will influence employers and employes in the discharge of their duties greatly to the benefit of the public, and of more efficient service. Yet it is a matter, as the author so well suggests, that

will be accepted slowly by railroads. I congratulate the academy upon the presentation of this paper, as it is sure to serve as a basis for a future work that will result in good for our companies and the general public.

Dr. FRED J. HODGES, of Ashland, Wis.—I would like to present an observation which, although drawn from a different field, bears out the suggestion made by the distinguished author. It is in regard to factory employes and those that work six days out of the week. I think those who have largely to do with this class of cases will recall that the greater number of casualties occur on Saturday and Monday. It is not because of rest or change on these days. but it has usually been interpreted as meaning that two mental processes were being carried on at the same time; that on Saturday a man contemplates the vacation of the Sunday; on Monday he reflects on the enjoyment of the same. I have exchanged opinions with a number of members of tbe profession who have come largely in contact with this class of people, and they recognize this fact. I am not aware of the existence of any statistics that will bear out this idea, but I repeat that the greater number of casualties among this class of laborers occur on the days mentioned.

Dr. T. B. LACEY of Council Bluffs, Iowa—I have been much pleased in listening to this paper. It is a new departure from the average medical society paper, but nevertheless very acceptable, and it touches a point that deserves more consideration than it has received. The subject ought to be thought of and papers bearing on it should be presented in the future, giving greater thought and research. Recognizing the conditions spoken of by the writer as to the mental state, it occurs to me that the remedy is almost unattainable. There have been many remarkable examples of this absent-mindedness; perhaps it is more than absent-mindedness, in that it is almost a complete loss of mental activity. Bearing upon this very point, Lombroso, the great criminologist, mentions the case of Napoleon, who was an epileptic. Two of the battles that were lost by him occurred at a time when he was afflicted with a lapse of mental activity. It is supposed that there was cortical degeneration in the case of Napoleon; but in other phases of the man's life, he was an absolute genius. The question

arises, is it not possible that many operators who are considered perfectly normal have some slight taint of cortical degeneration, and that while they may seem perfectly normal mentally and physically, they may have absent mindedness come on instantly, without any premonition, or without ability to throw it off?

Dr. W. W. GRANT—One word more. I would not like quite so pessimistic a view to go out from this academy as my friend Lacey would indicate. Regardless of the writings of Nordau and Lombroso, it is a fact that we can by education and training largely overcome evil habits, and this condition is largely one of habit. The mere fact that this matter is considered from the right source, as it has been to-day, and the attention of employes and employers directed to the danger of these lapses, I believe that by a system of education and discipline we can in a large measure remedy the defects which the author has so beautifully and elaborately shown.

Dr. R. HARVEY REED of Rock Springs, Wyoming—I do not think that we have had a subject before us at this meeting, notwithstanding the many interesting and practical topics that have been discussed for the last three days, that is of more practical importance than the one taken up by the distinguished essayist in his paper. It certainly demonstrates the absolute necessity of the examination of all employes, from the lowest to the highest, who have anything to do with the handling of trains or the management of the switches along the line of the road. Take, for instance, the particular class which is referred to in this paper. We need something, as the essayist has said, that will put a check on where there is now no check. The question then arises, how are we going to accomplish this end? I believe there is a remedy, and that it will come about through a thorough inspection and examination of the employes of the respective departments. Take, for instance, the telegrapher. As has been said, he becomes accustomed to doing certain work and does it mechanically. I think we have all observed in our experience in hospitals the same thing in the case of a new nurse who is learning her profession. She is more attentive to her work than an old nurse, or one of long experience, because she is learning with expectations ahead of increased remuneration, whilst the other has reached the cli-

max and does her work automatically for simply what she gets out of it in the way of pay. The average telegrapher receives certain pay per week or per month and has no expectation further than that of being a telegrapher the remainder of his days, and he, too, does his work in a sort of automatic manner. Telegraphers become so familiar with their work that they do it without stopping to think what they are doing until a mistake is made or a railroad accident occurs. But back of all this we will find that the telegrapher after years of experience becomes more or less nervous. I have noticed this in my experience. Many of them become addicted to insomnia, and in order to overcome this, they take some drug to make them sleep. They lose their sleep at night; they are on a strain during the working hours, and many of them use a stimulant or sedative of some kind, in order that they may hold their positions and do their work, and it is almost impossible for us to discover this except by some special measures that may be taken on part of the company to investigate the matter. If a telegrapher consults the surgeon of the road and states that he has insomnia; if the surgeon finds out that he is in the habit of drinking, or of frequenting houses of prostitution, and exhausting his system, so as to be unfit for duty at night, it should be the duty of the surgeon to report him. But it is a delicate question to report a man he knows very well in his immediate district, and then, to substantiate his report it would get him into a row at once. How, then, are we going to arrange this matter? The only way which I can see at present is to follow the system adopted by the National banks and post-office department and have an inspector along the road, unknown to the employes, who shall make a quiet, minute examination into these matters. He must be absolutely certain of his facts when he turns in a report to the company, and be able to furnish proof of whatever he may report. I think if some such system was adopted and great care exercised in carrying out the inspection, great benefit would result to the company and the public.

Dr. J. P. Lord of Omaha—I, like the other members of the academy, have been very much interested in this paper. There are one or two points I desire to call attention to. In the first place, there should be a closer espionage of the habits

of railway employes. I believe this would reach as large a class from whom accidents are liable to occur because of irregular habits, excesses in drink and sexual indulgence. Family troubles, or perhaps scandals may arise, all which serve to intensely preoccupy the minds of those men guilty of these practices. A closer surveillance of the habits of these men would do a great deal toward eliminating these faults or defects. If the importance of these matters could be drawn to the attention of men holding responsible positions, like engineers; if they were held accountable for certain knowledge on these subjects; if there could be placed in their hands a manual covering numerous topics of this sort, it might give them an intellectual insight to those dangers and the possibility of accidents, which of itself might cause them to be more cautious than they are now. Discussing such questions as this, and the interchange of ideas may be the means of getting at the bottom of this great subject, and of doing much good.

Dr. E. H. Trickle of Cutler, Ohio—I think very few accidents occur from inattention on the part of engineers. I do not think the average telegraph operator is as attentive to his work as an engineer, a conductor, or brakeman. An engineer knows very well that if he fails to recognize a signal, his own life as well as the lives of the passengers is in jeopardy. On the other hand, the telegraph operator sits in his office; if he makes a mistake he does not suffer. A great number of accidents occur from mistakes made by station agents in failing to put out a flag, or to give the proper signal. Railroads should promptly discharge any employe, holding a responsible position, who is in the habit of drinking. While we are discussing mental characteristics and lapses of attention, let us consider another phase of the subject. I believe it is largely the practice of telegraphers to smoke. I agree with the previous speakers that all railroad employes should be investigated; they should be cautioned, and there should be some rule in regard to a habit or habits which are injurious to them. Smoking has a sedative effect and I do not think telegraphers should be allowed to smoke while on duty, and especially the men who have to do with the handling of trains.

Dr. R. Harvey Reed—There is one point I intended to speak of in my previous remarks, and that is the degeneration of the

brain following syphilis. I believe the essayist referred to it in his paper. I have had occasion in the last two or three years to see several cases in which the parties had until shortly before examination held very responsible positions and were considered very capable men. In one case in particular the man suddenly became mentally deficient. I recollect another case in which I reported to the superintendent that a man was incapable of doing his work, and that he was dangerous. The papers were prepared and the authorities notified, when he was brought before a jury and tried, and the jury cleared him. The judge, however, felt certain that the man was mentally deficient, and immediately called another jury and held another trial and upon this second trial the man was adjudged insane and sent to an asylum. Some time later the superintendent wrote me that he believed the man was developing sarcoma and that an operation was necessary. In the meantime I had carefully investigated the family history, and nothwithstanding the patient himself had absolutely denied a syphilitic history, I was informed by some of his near friends and acquaintances that in his earlier life he had had syphilis, had recovered from it, and had either forgotten it or else had concealed it, and this led me to believe that the growth which was supposed to be sarcomatous was really syphilitic. I wrote the superintendent advising him to put the man on syphilitic treatment, which was done. The supposedly sarcomatous growth disappeared, as did also the mental abberration, and the man returned to his family and to his work.

This case is a striking example of the care necessary in our examination of employes. If they have had syphilis when they enter the employ of the company there should be some record whereby such parties can be watched carefully, especially if they are doing such work as has been referred to by the essayist, where the strain of the mental faculties is very great. As I have said, they should be carefully watched, and if any signs of mental deficiency occur, they should be put on proper treatment.

Dr. BRIDGE (closing the discussion)—I have been interested in the remarks of the various gentlemen who have participated in the discussion on my paper, and particularly was I interested with reference to the remarks of Dr. Hodges as to the

increase of accidents in factories on Saturdays and Mondays. I think he is correct, and that the increase of them is probably to some extent due to the anticipation of the pleasure on the day of rest. I should expect that that increase would be somewhat due to the fatigue incidental to the week's work, and not only on Monday are operators thinking of the good time they had the day before to distract attention from their work, but they usually come to their work on Monday much fatigued from hilarity. It is common enough for good people te use up considerable energy Sunday, and indeed all sorts of people who seek recreation and rest, so that they get little sleep on Sunday night, resume their labors on Monday morning with coated tongue, bad digestion and drowsiness. I think if one were to observe the number of accidents that occur on Tuesday, it would be a good test. From what has been said, I believe statistics will show that Tuesdays would witness the lowest per cent. of accidents of the whole week. I should rationally expect that to be the case. How to prevent railroad operatives from going to their work fatigued or sick is certainly a great question.

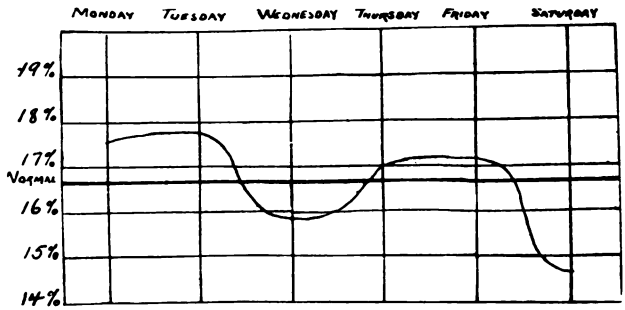
[Dr. BRIDGE's paper was so suggestive that the editor undertook to determine what, if anything, the statistics of large concerns having to do with great numbers of accidents might show in this connection. We were so fortunate as to secure the very cordial and valuable co-operation of Mr. F. J. Canty, Superintendent of the Claim Department of the London Guarantee and Accident Company's American branch. Mr. Canty furnishes the statistics of his company for six months during 1896, dividing accidents into those due (*a*) to contributory negligence, (*b*) faulty construction, (*c*) negligence of fellow-servants, and (*d*) those in which it was impossible to determine the cause. Classes "a" and "c" are naturally the ones of interest in this connection, as due to carelessness, and the others will be disregarded for the present. There were reported to this company during the six months ending August 31, 4640 accidents, of which 3260—classes (*a*) and (*c*)—were caused by the negligence of someone. It is to be regretted that there is not some way of determining how many of the injured worked on Sunday and for how many it was a day of rest, that having an important bearing upon this special inquiry, but there is not, and

accordingly that element of error is introduced into the figures which follow. The injuries reported as received on Sunday are thrown out, making a partial correction of that element. The statistics as furnished by Mr. Canty give the number of accidents occurring upon the various days of the week for each of the six months, but a summary will suffice for the present purpose.

Accidents reported to the London Guarantee and Accident Co., Ltd., during the six months ending August 31:

	(a) Contributory Negligence.	(b) Faulty Construction.	(c) Negligence of Fellow Servant.	(d) Undetermined.	Per Cent of whole.
Sunday . . .	106	45	6	5	Thrown out.
Monday . . .	539	191	34	18	17.5
Tuesday . . .	522	161	56	28	17.7
Wednesday .	492	176	24	34	15.8
Thursday . .	519	175	36	29	17 0
Friday . . .	534	189	29	27	17.2
Saturday . . .	454	165	22	25	14.6
	3165	1102	207	166	99.8

The whole number of "negligence" accidents being 3372, 3260 occurred upon week days and the percentage of each day's accidents to the whole number of week-day accidents being found, they may be represented graphically thus:



It would of course be extremely dangerous to attempt positive generalizations from so few instances, particularly as the figures contain a recognized element of error; however, we may be pardoned for calling attention to a few circumstances; 16.6 per cent. being the average percentage for each of the week (6) days, it is used as the base line. So far as these statistics may be followed, they show the greater number of acci-

dents of this class upon Tuesday, Monday, Thursday and Friday being only a fraction of 1 per cent. behind.

This particular group of figures shows a marked falling off of accidents upon Wednesday, which, if it were found to be constant, would be rather hard to explain. By far the greatest falling off is, however, to be observed upon Saturday. This is explained in part by the practice, in many parts of the country, of shutting down the factories earlier upon Saturday, but would hardly seem to account for it altogether. If the findings of this group of figures shall have any force at all, they tend to show that what might be called "normal bodily fatigue" does not increase the probability of accident and that the editor's impressions so far as the frequency of accidents upon Monday were well founded, while they show as unmistakably that we were in error as to Saturday. They also suggest that mental distraction rather than fatigue of either body or mind is concerned with accident production.

Mr. Canty recalls that in the German Economic Exhibit at the Columbian Exposition, it was stated that throughout Germany the greatest number of factory accidents occurred at 11 o'clock on Friday, a fact not inconsistent with this table, since we find in it for Friday a percentage of 17.2 as against a maximum of 17.7 per cent. on Tuesday.

This is a subject which involves dollars and lives, and as the industrial statistics of the government shall become more and more exhaustive, study along the lines here indicated may serve to locate this psychic danger. As Dr. Bridge well said: "At present our difficulty over the question is its novelty."—*Western Clinical Recorder*, Jan., 1899.]

Chapter II.—Emergency Surgery.

CONCEALED TRUMATIC MENINGEAL HEMORRHAGE.

BY H. REINEKING, M.D., Surgeon C. & N. W. R'y.
SHEBOYGAN, WIS.

The appropriateness of the title of my paper may, strictly speaking, well be questioned, for to the well-informed physician or surgeon no intracranial hemorrhage, of any considerable amount, could long remain *concealed.* I have applied the term, and shall limit my remarks, to cases in which there is absence of outward flow of blood and of fracture or fissure of the cranium, but in which the presence of a hemorrhage is usually indicated by unmistakable symptoms relating to the intellectual, sensory and motor functions. The following case illustrates so typically the usual symptomatology and course, as well as the results to be expected both under the expectant and the operative plans of treatment of this important class of cases, that I wish to put it on record, and might well offer it in lieu of any dissertation on the subject. If, in attempting to present briefly the most advanced views on this subject, so important to the railway surgeon, I shall succeed in calling forth discussion and eliciting an expression of the experience of the Fellows present, I shall have reached my purpose.

Case 1.—C. W., a farmer, aged 54 years, of good previous health and good habits, was injured May 13, 1898, in a runaway. So far as could be ascertained, he was thrown from his wagon and struck his head on the stone curbing. He was stunned for a few minutes, then regained semi-consciousness and never afterward became fully unconscious. According to the statements of the attending physician, he acted, during the first few hours after injury, very much like a person under the excitement of alcoholic intoxication—wanted to go home, and was very unmanageable. Up to the time of being put to bed, which was nearly an hour after the injury, he seemed to have full control of his extremities. Aside from a few bruises on various parts of the body, there were two deep scalp wounds in the upper portion of the right parietal region, but no evidence of fracture or fissure of the skull was found at this or any subsequent time. The wounds were dressed and the patient put to bed and quieted by a hypodermic injection of morphia. The next morning the left side of the face, trunk and upper and lower extremities were found paralyzed, both as to sensation and motion; delirium continued, temperature and pulse were normal. The exact time at which the hemiplegia set in could not be determined.

On my first examination, two days after the injury, there was complete left hemiplegia; the pupils equal, fixed between dilatation and contraction; both eyeballs turned upward and to the right, the patient able to turn them to the left to a slight degree, but unable to hold them under control beyond a few seconds. The tongue was protruded normally. The patient was partly comatose, at other times very restless, talking incoherently. Urine and feces were mostly passed unconsciously. Temperature and pulse were slightly above normal, breathing not disturbed. The symptoms described pointed unmistakably to the existence of a clot, producing pressure over the motor area of the right cerebral hemisphere, and of sufficient size to interfere with the function of this entire area. The scalp wounds were found infected; they were, therefore, reopened, enlarged, and treated openly. A very thorough examination of the skull made at this time failed to show the least injury to the bone.

The conditions described called urgently for operative relief of the pressure, and this was promptly advised, but it was not

until May 21, eight days after the injury, that full consent was obtained and the operation undertaken. Meanwhile there had not been the slightest improvement in the symptoms, showing that little was to be expected from absorption or contraction of the clot. Hemiplegia was absolute; urine and feces were passed automatically; mental condition was very irrational, with great restlessness.

In planning the operation and deciding as to the point at which I should enter the cranium, I took into consideration the length of time elapsed since the injury, which, together with the stationary character of the symptoms, made it almost certain that there would be no necessity of ligating any vessel at this time; it was also evident that an opening made anywhere over the motor area of the injured side would be certain to expose the clot. The location of the scalp wound was therefore decided upon, the wound slightly enlarged downward, and the trephine applied at a point four and one-half inches behind the external angular process of the frontal bone, and four inches above the external auditory meatus. This locality proved a favorable one for the evacuation of the clots, but subsequent events showed that for the purpose of good drainage, an opening farther back would have been even more advantageous.

The opening was made with a three-quarter-inch trephine. As soon as the button of bone was lifted, the black mass of clotted blood presented itself, showing it to be extradural. While the mass showed slight pulsation, imparted to it from underlying vessels, it did not bulge into the opening, owing probably to the length of time the pressure had existed and to the consequent loss of elasticity in the compressed structures. The clots were turned out with a small Volkmann spoon and a strong current of sterilized water from a fountain syringe. They were found to cover an area measuring about five inches antero-posteriorly and two and one-half inches vertically, and separating dura and cranium for fully an inch at the central portion of the mass. As the greater portion of this space lay below and behind the opening, the latter was enlarged in these directions with a rongeur forceps, until free access was had to every part of the cavity. Hemorrhage was slight; there was no evidence of laceration of the dura, no roughness of the inner table. It soon became apparent that

there was not the slightest tendency for the brain to expand and fill the cavity, so the latter was loosely packed with iodoform gauze, the wound left entirely open, and a gauze dressing applied. After the operation the temperature, which on the day previous had been 102.2, fell at once and, after four days, was normal and remained so. Pulse, after operation 124, came down to 90 in a few hours and remained good.

The patient's mental condition began to improve almost immediately, and always kept in advance of the improvement in the functions of motion and sensation. Involuntary passage of urine and feces ceased after three days. An early sign of improvement was the return of normal action of the ocular muscles and of the pupils. Then the face resumed a natural expression, together with the return of sensation and motion on the affected side. For two days after the operation there was not the least evidence of improvement in the extremities. On the third day the patient could move the hand and fingers, on the fourth could raise hand and forearm. On the fifth day motion was first noticed in the foot, and he could raise his hand to the face. Motion in the toes returned on the ninth day, on the eleventh he lifted leg and foot slightly, and could move them freely the next day. Sensation returned slightly in advance of motion.

The intellect had by this time become quite clear, and his general condition was good. But the local conditions were not so satisfactory; the cavity had diminished but slightly, and there was a large amount of discharge of a reddish-brown liquid which was but imperfectly removed by the gauze drain. A small dressing-forceps could still be passed about freely in the cavity, and could be passed backward and downward for a distance of four inches. A counter-opening was accordingly made at a point four inches behind and below the first opening, and the same distance from the external auditory canal, which brought it over the most dependent portion of the cavity when the patient was resting on his back. A gauze drain was inserted from opening to opening, and further packing dispensed with. This afforded good drainage, the cavity diminished rapidly, and healing was soon complete. Meanwhile the improvement in regard to intellect, sensation and motion had been rapid. June 9, nineteen days after the first operation, he

walked about his room unaided, and soon regained the full control of his extremities. He left the hospital June 24, just six weeks from the day of injury. August 31, nearly four months after the injury, he called at my office, to all appearances a perfectly well man. The trephine openings had become filled with hard cicatricial masses, apparently containing considerable bony callus, and no tendency to hernia cerebri could be detected.

Of the clinical features of the case, the absence of dilatation of the pupil of the injured side was unusual, considering the great increase of intracranial pressure and the regularity with which it is found in similar injuries. As the *modus operandi* of the effects of intracranial pressure on the pupil is not understood, I will venture no theory for the explanation of the absence of the dilatation in this case.

The important questions which confront the surgeon in the consideration of this class of cases are: 1. Whether to operate; and if so, at what time? 2. The choice of the most advantageous point for opening the skull. 3. The method of operating, including the choice of instruments for perforating the bone.

As to the first question, whether to operate in a given case, and as to the best time for such interference, it may be said, that, with the indications and diagnosis reasonably clear and certain, the less time is lost in expectant treatment, the better will be the patient's chances, both as to immediate and remote results, provided that he is not in a condition forbidding all operative interference, or that, on the other hand, rapid improvement has not already set in. Not only will the immediate danger of fatal hemorrhage be thus removed, but the deleterious and often permanent effects of long-continued pressure will also be

avoided. But on the other hand, the surgeon should not hesitate to undertake the operation, even if called at a late stage of the case, as very good results are known to have followed on surgical measures instituted many days after the injury.

The diagnosis is, as a rule, not difficult. The symptoms will vary in minor respects, according to the location of the hemorrhage and the centers pressed upon, and must be interpreted in the light of anatomic and physiologic data and the teachings of cerebral localization. The lapse of a varying interval of time between the receipt of the injury and the onset of unconsciousness, or of hemiplegic symptoms, is one of the most pathognomonic evidences of meningeal hemorrhage, and generally indicates the extradural form. The length of this interval is in inverse proportion to the rapidity of the hemorrhage; it may be entirely wanting where the hemorrhage is rapid, or other grave lesions present, or may be unnoticeable or obscured by unconsciousness due to concussion or other conditions. When present, it serves to distinguish the attack from an ordinary apoplectic seizure. The longer this interval, the more likely is the hemorrhage to be found extradural, as the attachment of the dura to the inner surface of the skull offers some resistance to the accumulation of blood, and thus retards the onset of pressure symptoms.

Inequality of the pupils, due to the dilatation of the one on the injured side, is one of the most constant symptoms, yet too much importance must not be attached to its absence, as shown in the case just reported. The same is true of the deviation of the eyeballs upward and toward the affected side. The

condition of the sensorium also varies widely: from perfect clearness of intellect, through all the shades of mild disturbance, to restless delirium and deep coma. In severe forms, the respiration is usually slow, irregular and stertorous, but may remain unaffected, even when other symptoms are very pronounced. Slowness of the pulse is another symptom of some positive value, yet the pulse may be found normal, or even increased in frequency. Hemiplegia of the arm, arm and leg, or of the entire side, generally appears in the order mentioned, and rarely affects the leg alone or in advance of the arm; as a rule it is well-marked, but is found in all grades of severity. Sufficient diagnostic data can usually be gathered, that, when taken in connection with a history of trauma and evidences of injury to the scalp or cranium, they will suffice to lead the medical attendant to a pretty clear conclusion, both as to the presence of a hemorrhage and to its situation in relation to the brain centers and to the cranium. Cases in which the symptoms are so obscure as to afford no clue as to the location of the clot are not favorable for operation, but whenever the indications are reasonably clear, the patient should be given the benefit of possible relief by surgical interference, as the opening of the skull and dura, if properly done, exposes the patient to but little risk.

As to the second question, the most favorable point for entering the skull, the surgeon must be guided by anatomic considerations, the stage of the case at which he is called, the focal symptoms present, the location of wounds of the scalp, and the requirements for drainage. In all recent cases, unless the focal

symptoms point clearly to other localities as the seat of pressure, it will be advisable to make the opening at the point usually recommended in the text-books, viz., one and one-half inches above the zygomatic arch and the same distance behind the external angular process of the frontal bone. Here an opening of an inch in diameter will expose the anterior branch of the middle meningeal artery, which, in the great majority of cases, is found to be the bleeding vessel. If the dura has been separated from the bone, the artery will be found imbedded in this membrane, lifted away from its groove in the bone. If bleeding, it should be ligated with a catgut ligature passed around it by means of a small curved needle, care being taken to include as little as possible of the dural tissue. In case the artery can not be secured, packing with iodoform gauze should be resorted to. The opening is to be enlarged by means of rongeur forceps, as the necessities of the case may require. If the operation is undertaken after the lapse of several days and the pressure symptoms have become stationary; in short, when the necessity for ligating the vessel has pretty certainly passed, the surgeon will first of all be guided by the focal symptoms, and when the compressed area is large, by the other considerations above mentioned.

As to the method of operation, no strict rules can be laid down, except that it must be done under the most rigorous antiseptic precautions, with the least possible amount of injury to the structures protecting the brain. The hemorrhage must be controlled, the clots thoroughly removed, drainage whenever there is a cavity must be thorough, and the results which often

remotely follow these traumas must, as far as possible, be guarded against.

There is some diversity of opinion as to the advantages and disadvantages of the trephine on the one hand, and the chisel and mallet on the other, as implements for opening the cranium. It probably matters little which instrument is used, provided the operator is thoroughly familiar with the one he uses. Personally, I consider the trephine best adapted to these cases. The dura is either found separated from the bone, so as to be protected from injury by the instrument, or, if the hemorrhage is intradural, it generally requires free incision, unless lacerated beforehand. The chief argument advanced against the use of the trephine—that of injuring the dura—has no weight, in these cases at least.

Moses Gunn, in an address before the American Surgical Association, in 1882, said: "In this connection I venture to put in a plea for the much-dreaded trephine. The operation of removing a disk from the cranial walls, performed with proper care and skill, is not an 'operation fraught with danger.' There is very little risk of injuring the dura mater with that instrument. If that membrane has not been wounded in the occurrence of the accident for which we resort to the use of the trephine, its safety from injury by that instrument may be pretty confidently assured. And while I thus defend the proper use of the trephine, I desire also to protest against the use of the chisel or gouge on the cranial walls, if the propelling force is applied by a series of blows from mallet. A single blow of the force usually required may be insignificant, bnt the result of a number of them in

rapid succession must be proportionate to the aggregate amount of all the blows. Thus estimated, we may not be surprised at symptoms of concussion following its use." With the use of the rawhide mallets and improved cutting instruments, there is no doubt but that the chisel can be used with perfect safety if the mallet is used with that care and delicacy which should characterize all operative work on the cranium, while in large osteoplastic operations these instruments are simply indispensable.

Wounds of the dura mater should, when practicable, be sutured, but when the injury is such that this can not be done, a piece of gold foil, large enough to extend beyond the margin of the defects, should be inserted *between dura and cortex cerebri.* This will prevent adhesions and protect the patient against many of the remote effects of head injury. This gold foil can be prepared by annealing a number of layers of dentist's foil, may be cut into sections to facilitate introduction, and should be stiff enough only to be easily inserted. In the absence of a cavity it will be held in place by mere contact with the tissues. It should be one of the articles constantly in the surgeon's armamentarium. In recent and perfectly aseptic cases, where drainage is not required, the bone removed should be cut into chips, replaced, and the wound closed, or a trap-door-shaped flap of bone and overlying soft structures may be raised, to be put back into place after stopping the hemorrhage and cleaning away the clots. When drainage is required, it is advisable to leave the defect in the bone open, as infection and retention of discharges must above all things be guarded against, danger from this source

being far more likely to occur than any subsequent trouble from hernia cerebri.

DISCUSSION.

Dr. W. W. GRANT of Denver—There are several points in this paper worthy of thorough discussion. In the first place I believe that the opening in trephining, whether for depression of the skull or not, should be as small as possible and permit the accomplishment of our purpose in operating. Not infrequently the ulterior consequence of an operation—owing to the large cranial defect—has been worse than the disease we have attempted to remedy. Epilepsy quite constantly follows firm cicatricial adhesions between the dura and the cortex, and for this reason many surgeons now hesitate, unless there are decided symptoms of compression, to operate, guided as well by the fact that many of these patients do exceedingly well and never have any bad after-consequences. I have had personal experience with a number of such cases. To prevent the formation of cicatricial tissue or adhesions, it is a question in surgery what is the best material to use, but gold foil is generally so accepted. Dr. Freeman of Denver, has been experimenting with the lining membrane of egg shell for this purpose, and he has had some satisfactory results which he reports in a recent issue of the *Annals of Surgery*. Small fractures can be better treated by chisel and mallet than by the trephine, for one may often put an elevator under the depressed portion and raise it without removing it. In this way you will minimize the danger and unpleasant consequences which result from adhesion of the tissue.

Dr. W. L. SMITH of Streator, Ill.—A few years ago I saw an operation on the head. The Doctor quotes the late Dr. Moses Gunn, who was a good surgeon in his day. I have also heard Dr. Gunn say that pus was dead or dying blastema. This statement was all right for that period. So far as making a hole in the skull where an injury is concerned, if there is not a hole already made, I believe the better plan is to use a chisel and mallet, so that we may have plenty of chance for drainage. We can not secure effective drainage through a three-quarter-inch trephine hole; neither can we tie an artery if it is bleeding. So far as making pressure to control hemorrhage is con-

cerned, I have little faith in it. I have made several operations on the head with chisel and mallet, and have not had any serious results from concussion or anything of that kind, and I believe, if we are as careful in making a hole in the head as we are in the abdomen we will have just as good results. If the Doctor had used chisel and mallet and raised the flap of bone, he would have had plenty of room for drainage, and, I think, would not have had to make a second operation.

Dr. FRED J. HODGES of Ashland, Wis.—From an analysis of the case and history related one would interpret gradual hemorrhage from a small vessel. That being the case, I do not think that the inequality of the pupils is a matter of any new or added interest, for the reason that the brain is very tolerant of pressure, when gradually applied, and if this same degree of pressure had been applied as a result of the hemorrhage from a large vessel, there would undoubtedly have then been a difference in the pupils, and the same difference in effect would have been observed in regard to the mental faculties. The mental faculties would have been entirely and quickly extinguished; whereas the pressure being so gradually applied, they were impaired rather than extinguished. I have seen the same group of symptoms produced from an extradural rupture of the superior longitudinal sinus. So even with this group of symptoms it is not safe to assume that you are going to come down on a mass of clotted blood. In a case I operated a short time ago, after making a small trephine opening in the skull, there escaped a column of venous blood at least two and a half inches in height. We waited a few seconds to see if there was a blood clot, but there was no change in the extent or force of the stream. The opening was closed, and another made farther down on the parietal with the hope of getting outside the hematoma. But that giving us the same result, a small piece of gauze was introduced from without to encourage clotting, and the scalp wounds closed. As soon as a blood clot formed the symptoms disappeared, and the patient recovered without any further interference. Bearing this in mind, it is just as well to investigate, as far as you can, the state of affairs before removing the entire button, if you use a trephine, or as soon as you make a small opening, if you use a chisel. I do not know how the case could have been treated if a large button had

been fully liberated. Evidently there was a large rent in the sinus and to have controlled that through a large opening would have required considerable ingenuity.

Dr. ARTHUR D. BEVAN of Chicago—I just want to defend Moses Gunn in his definition of pus. I do not believe that any more rational short description of pus has ever been given than that by Dr. Gunn, namely: "Pus is dead or dying blastema." It certainly fills the bill even in our advanced stage of pathologic knowledge. Pus is derived from the white blood corpuscles and the embryonal cells, and although Gunn's knowledge of the more refined pathology involved in the production of pus was not up to our present data, yet I should like to defend the general proposition. In the same way, I should like to defend the use of the trephine in just such cases as the Doctor has described in his paper. I would use the trephine in preference to the chisel, because, as a rule, in cases of rupture of the middle meningeal artery we can locate approximately the point of rupture. I do not say that is constantly so, but the general anatomic rule given is fairly accurate—an inch and a half above the zygoma and an inch and a half behind the external process. A 1½-inch trephine will locate the seat of rupture in nine cases out of ten, and 90 per cent. of the cases of hemorrhage are from the middle meningeal artery. The trephine exposes a small area, and you can locate it definitely. It is covered by the temporal muscle and deep fascia, and is in a position where the loss of half an inch of bone is not as apt to result in symptoms at the end of a month or years as it would be in the upper portion of the parietal eminence, for instance, where it is not covered by the deep fascia and temporal muscle. With reference to the inability to ligate a vessel through a trephine opening, I should say that I have done this twice, having ligated the middle meningeal artery through a half-inch wound, and in another instance through a three-quarter-inch opening.

I am opposed to the use of gold foil. In a case where we have to remove a small area of bone, especially where it is deeply covered by muscle and fascia, I am inclined to believe that we would be less likely to have epilepsy follow in the lapse of months or years where we had allowed the external periosteum to remain, than where any foreign body is inter-

posed. The use of celluloid, of a gold plate, of gutta-percha tissue, has been tried in a few cases, and the results have been unsuccessful. I know of several cases where either celluloid or gold foil has been employed and it was necessary to remove it. I do not think those cases have found their way into the literature; it is the successful cases that are reported. While not wishing to consume too much of the time of the Academy, I desire to relate briefly a case which I have had recently, illustrating this class of lesions:

A man, a bricklayer, was in a shaft; his companion had been working with him. The companion left to go to some other part of the building, was gone about half an hour, and when he returned the man was lying unconscious at the bottom of the shaft. An ambulance was called; the man was brought to the Presbyterian Hospital; we examined him carefully and found no evidence of any lesion with the exception of a slight contusion on the side of the head. The urine showed sugar; a diagnosis of diabetes was made. We watched the case carefully, as one of probable diabetic coma. The patient died. Postmortem examination revealed rupture of the middle meningeal artery as the cause of the coma and death. I am inclined to think in such cases as that we would be justified in making an exploration for diagnosis. I am rather inclined to believe from my experience with a few similar cases, that an early operation would have saved the man's life.

Dr. EDWARD DOOLEY of Buffalo, N. Y.—I was very much interested in the paper, and from the remarks made by several gentlemen I noticed a great deal of stress was laid on the danger of the adhesions that are apt to form. I recall a case that came under my observation about five years ago:

A young man riding on an engine, in jumping off, struck the top of the switch frame and sustained an extensive compound, comminuted fracture on the left side of the skull. Much of the bone was broken into small splinters, which I removed without using either chisel or trephine. I should say I removed altogether an area fully two and a half inches square, including the left parietal eminence and the bone below and in front of it. The dura was lacerated, a blood-clot that had formed was removed, the wound united with catgut and dressed with iodoform gauze. The condition of the patient was such that I was

in a hurry to get him off of the table, thinking he was going to die, but to my great astonishment the young man recovered. He suffered from aphasia for ten days, but gradually his intelligence and speech returned, so that at the end of six weeks he was able to leave the hospital. The young man has been at his occupation as a switchman ever since, it now being five years since he sustained the injury. There is certainly cicatricial tissue covering the entire space over the left parietal eminence, and he has not had any epileptic seizure or paralysis.

This is an exceptional case. I do not wish to be understood as saying that it is unnecessary to use gold foil, but there are undoubtedly cases where we will not have epilepsy or paralysis, even though there be a cicatricial scar over the brain substance.

Dr. R. Harvey Reed of Rock Springs, Wyo.—There is one point I would like to refer to in regard to the Doctor's paper, and that is with reference to the instrument which is to be used in opening the skull. I have used the chisel very freely, the trephine and the DeVilbiss instrument, and I do not think that, from a surgical standpoint, it makes much difference which is used. There is an important point in the matter, viewed from a medicolegal standpoint which a personal experience of my own well illustrates.

I was once called to see a man who had been assaulted and left for dead by his assailants. He had been attended by some physicians of the neighborhood until he developed a paralysis of the right side of the face and the left arm and leg some four days later, when I was called in consultation. I recommended operation, which was agreed to. I removed a good-sized flap by means of the chisel and mallet, and over the arm and leg area found the dura bulging out boldly and without pulsation. This naturally led to the expectation of finding a clot under it, but an incision only released a little serum. Aspiration of the lateral ventricles removed about two ounces of blood and serum and allowed the brain to resume its normal relations. Wounds of the dura and scalp healed primarily, and the patient did well for a time, but two weeks later began to do badly and finally died. At the trial of his assailants, the defense assumed the position that the doctor had killed the man. In his argument the attorney said: "Gentlemen of the jury, think of this

man taking a great chisel and an enormous mallet and pounding and pounding until he cut a hole in the poor man's skull three inches in diameter. Is not that enough to kill any man?" Of course the murderers were set free and I was discountenanced. Gentlemen, we are treating patients that are corporation cases. and while I feel and know that I contributed in no way to the death of this man by the use of the chisel, yet at the same time if I had used the DeVilbiss rongeur, I would have avoided the charge by the attorney of having "pounded his head with a mallet" and would have accomplished the same results. For this reason I believe that it is well to avoid the appearance of evil—at least in such cases as may eventually come before the courts—and by so doing avert trouble for the corporations for which we are working, or as in this instance, turn loose criminals whose place is in the penitentiary.

Dr. W. J. Mayo of Rochester, Minn.—I am going to ask the essayist one or two questions, which I hope he will answer in his closing remarks. The first one is this: In case the focal motor symptoms do not agree with the injury, would he go down on the focal lesion, or go on the side of the injury? I consider this an important point. In two of the three cases which I have seen, the external wound and the motor symptoms did not agree. There is no class of cases more confusing to us than these. A man sustains an injury of this kind and develops thrombosis; you cut down, open up the calvarium, and find an edematous brain, the symptoms coming on soon after the injury. I recall one case, the history of which was exactly that of the case described by the Doctor, yet it was due to a progressive thrombosis. Dr. Reineking is certainly to be congratulated on the result obtained in his case, and it is an encouragement for us to operate whenever we encounter these cases.

A good deal has been said in regard to the use of the chisel and trephine. I do not think it makes much difference which we use. My brother and myself do considerable surgical work on chronic cases of this character in two large asylums, and I should say that it is a question of choice between the chisel and trephine. I do not think the little taps we give with the chisel would make much difference. I am inclined to think that those who oppose the chisel so strongly have not used it

many times. The DeVilbiss instrument is certainly a fine one to work with.

Dr. REINEKING.—In reply to Dr. Mayo's question as to where I would trephine in a case where the symptoms disagreed, the injury being on one side and the focal or pressure symptoms on the other, I should first trephine on the side toward which the pressure symptoms pointed, and if unsuccessful there and the symptoms persisted, I should not hesitate to trephine the other side also.

Dr. FRED J. HODGES of Ashland, Wis.—I would like permission to make one further remark in regard to this class of cases. Dr. Mayo touched upon one of the most important points in the whole matter when he asked the question as to the site of the operation. In the July number of the *American Journal of the Medical Sciences*, for 1894, I think, Walton, one of the senior surgeons of the Massachusetts General Hospital, in an elaborate paper, cites a number cases in which he reaches the same conclusion or lays down the same proposition as that announced by the essayist, namely, that he would operate at the site of the focal symptoms. I believe this to be radically wrong. Surgeons have gone far in advance of the physiologists. If you will consult a standard text-book on physiology, you will be reminded that the decussation in the anterior pyramids varies all the way from no decussation whatever to complete decussation. It takes a vivid imagination to make a great many reported cases conform with the generally accepted idea among surgeons that injury on one side produces paralysis on the opposite side. If you will study cases in the light of physiology, you will find that decussation is not constant by any manner of means, and the surgeon is misled in operating at the site of focal symptoms. I had a case at the time of this report which beautifully illustrated that point. The man was operated upon for epilepsy about a week after his first convulsive seizure. On examination, there was a scar found on one side of the head which he said marked the infliction of a bullet-wound eleven years previously. This was on the right side of the head, and the post-epileptic paralysis was on the right side of the body. Following the Walton rule an operation would have been undertaken on the left side; but following the common-sense rule, operation was made on the right side, when

two-thirds of a 38-caliber bullet was found encysted in scar tissue just within the surface of the cortex. The bullet was removed, and the scar tissue excised. It is now nearly four years since the operation was done, and the man is absolutely free from any central disturbance.

If you will gather carefully the clinical reports of skull injuries, you will find that it requires a vivid imagination to make the clinical history correspond with the idea of invariable decussation, and for the best of reasons—it does not exist.

While an interne in Cook County Hospital in this city, a man was brought in with fairly well-marked focal neurologic symptoms following an injury to the head—an injury that was not easily localized externally. A surgeon of this city, who has given a good deal of attention to brain surgery, cut down upon the supposed point of pressure and found nothing. He needled the brain in various directions with the same results. We had the gloomy satisfaction the following day of discovering a large clot on the opposite side of the head. The clot was on the same side as the paralysis. The proper explanation occurred to none of us at that time. Now I am certain that it was a case in which there was no decussation. Surgeons can not safely go in advance of the physiologists. The site of the injury is a safer, more rational guide to operation than the localization symptoms.

Dr. R. Harvey Reed of Rock Springs, Wyo.—The remarks of Dr. Hodges recall a case which to me was a very odd and interesting one, and which I will report briefly:

A miner was struck on the top of the head by a falling rock, which inflicted an extensive compound comminuted fracture of the skull. I did not think he would live, but felt it my duty to go ahead and do the best I could, so I removed an area of bone, perhaps 2½ x 3 inches, that was completely comminuted. The dura mater was lacerated apparently by almost every piece of bone, and in addition the brain substance itself was crushed. I should say that I removed from that patient brain substance to the quantity of at least half an ordinary teacup, and it oozed out for some little time after operation. Being an infected wound, I packed it and allowed it to heal by granulation. To my utter surprise, on the fourth day after the operation, the man got up and went out of the hospital

without a single symptom of paralysis, notwithstanding that the injury was immediately over the leg and arm area. On that day he walked four miles in looking up witnesses for a lawsuit that was to come off the next day. I supposed that if he did not die from the injury he surely would from the effects of so great an exertion. However, he remained in the hospital about two weeks, the wound healed rapidly, and he got well without any paralysis whatever. If we had any fear whatever of the formation of cicatricial tissue, we certainly would have it in a case of that kind. After leaving the hospital he resumed work for a considerable time, and was afterward run over by the cars, the leg and arm taken off, and the last I heard of him he was still living.

Dr. REINEKING (closing the discussion)—I purposely did not speak of depression or depressed fracture as indications for operative interference. I discussed cases presenting evidence of intracranial hemorrhage. Personally, I do not recommend the use of gold foil unless the dura mater is lacerated so that it is not readily sutured. I had a very happy experience with the use of gold foil between the dura and cerebral cortex, in a case of epilepsy. The man had as many as three attacks a day, and as many as fifteen or sixteen during the year, and since relieving the adhesions which bound down the cerebral cortex to its coverings and protecting him against further adhesions by the use of gold foil, thick enough to prevent adhesions, the seizures have completely ceased. It is now (October, 1898) eighteen months, since which time he has had no attack whatever. Shortly after the operation he had two slight attacks. I am afraid of adhesions between the dura and cerebral cortex. If we investigate the literature of operations for epilepsy, we will find it occurs where the adhesions and cicatricial tissue were beneath the dura.

In such a case as the gentleman from Buffalo (Dr. Dooley) cited, there was no occasion for using gold foil. I am not surprised that his case did well. We have all seen similar cases. It makes little difference how large the defect in the bone is as long as the adhesions are not deep. Even where they do exist epilepsy will not invariably occur any more than will nerve injuries be invariably followed by a neurosis or paralysis. In the case in which I placed gold foil between the membranes,

a skiagraph was taken about a year and a half later, and it showed the plates in position. The defect was large, and the foil, which was flexible, was inserted in four sections. The man has brightened up mentally, has been relieved of epilepsy, and certainly the case is one to make a surgeon a little enthusiastic in the use of gold foil. I am free to confess that I am an enthusiast on this subject. In cases where there is fracture or depression, I would use chisel and mallet, a gouge, or a DeVilbiss forceps, but in cases of simple hemorrhage without depression or fracture, I think a trephine is the nicest instrument. With it we remove no more than is absolutely necessary; we can enlarge the opening and do it well with a rongeur forceps. The size of the opening is no argument, and it was advised in my paper to enlarge the opening in accordance with the indications. In the case I reported, the bad drainage was not due to the use of the trephine, but to the location of the opening. If it had been made at the most dependent portion of the cavity, the drainage would have been good with the trephine opening, and with a single one. That was the sole occasion for making a second opening.

As I have previously remarked, many of these severe injuries will recover without the use of gold foil; but we never know which are going to be the bad cases any more than we know about injuries to the nerve trunks, etc., and we had better adopt the precaution of using gold foil. Sufficient clinical experience is on record, as evidenced by the cases of Roswell Park, Estes, and others, that the gold foil can be used with satisfactory results. I would not recommend its use in infected cases, because the first consideration must be thorough drainage and good antisepsis; neither would I make a bone flap or expose the bone chips in cases where the scalp is infected, as it was in my case. I thank you for the free discussion of my paper.

FRACTURE OF PATELLA.

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Fractures of the patella are not of frequent occurrence; they constitute about 2 per cent. of all fractures, and are found more frequently in the male than in the female—in the proportion of about five to one. Fractures of this bone demand careful consideration, on account of its close proximity to the knee-joint, and also in consequence of the imperfect way in which the fragments unite; fracture of the patella is caused by muscular action or direct violence. The direction of the fracture may be transverse, vertical, oblique or even stellate. In the fracture produced by sudden and violent muscular contraction, the transverse variety usually occurs; when the fracture is caused by direct violence, the direction may be vertical, transverse, oblique or stellate, or the fracture may be comminuted. In fracture of the patella the knee-joint is always opened, unless the extreme lower end of the patella is broken, in which case it is possible for the fracture to exist without the joint involvement. In most fractures of the patella there is not only opening of the knee-joint, but the fracture has also associated with it a tearing of the aponeurotic and fibrous coverings of the bone, as well as a laceration of the synovial membrane of the joint, and a

rupture of the prepatellar bursa; in consequence of the peculiar nature of this injury the joint is soon filled with blood, and the synovial secretion becomes abundant. The signs of fracture of the patella vary somewhat, according to the manner in which the injury occurred. Crepitus is generally absent in this fracture, on account of the separation of and the intervention of fibrous tissue and blood-clots between the fragments, the patella is lengthened with a well-marked sulcus, with ecchymosis, and swelling rapidly, appearing with a loss of the general contour of the joint. The usual mode of union, to which, of course, there are exceptions, by the older methods of treatment, is not osseous, but ligamentous or fibrous, with separation of the fragments; many ingenious and complicated devices have been invented by surgeons of reputation, all striving to accomplish the same object—to bring the fragments together and retain them in apposition until united—but almost without exception the union was fibrous, with separation of the fragments.

If by any device externally applied the fragments could have been kept in apposition, with our present knowledge of antiseptic surgery it would not have been up-to-date surgical treatment. The extravasated blood should be removed from the joint; that, with the lacerated aponeurotic fibrous tissue between the fragments, would prevent bony union. In some cases it was possible with some of the older devices to bring the fragments well together and retain them sufficiently fixed, yet the result was almost universal—non-union of bone. It was not position of the fragments alone that prevented union, but the condition

of the joint filled with blood-fluid, with torn shreds of tissue between the fragments.

I believe that in every case of fracture of patella with extravasation of blood and fluid into the joint with rupture of the capsule—which is the case in almost every fracture of the patella by railroad injury —the joint should be opened and thoroughly cleansed antiseptically and the fragments then sutured together. Before any method is resorted to with a view of bringing the fragments into apposition, the surgeon must endeavor to control and modify the joint inflammation. For this purpose the usual treatment of cold application by ice-bag or cold irrigation is very generally resorted to; where there is a good deal of superficial ecchymosis, warm antiseptic fomentation is applied. You should never operate on fractured patella immediately after the injury has been received. The object of the preparatory treatment having been attained, the question as to the method of operating will next claim the surgeon's attention; this should, to a certain extent depend upon the nature of the fracture, whether simple, comminuted or compound. Yet, when accompanied with the usual complication of hemorrhage and joint injury, the operative procedure should be the same in either case. Should the fracture be compound, the operation should be performed immediately after the accident. Every surgeon will recognize the necessity for strict antiseptic precaution before, during and after the operation; the slightest mistake or carelessness in the minutest detail of the operation may cost a limb, or even a life. At the present time very few, if any, surgeons resort to the various ingenious external devices (with which

you are all familiar); but rather open the joint, thoroughly cleanse it, render it aseptic without a doubt. then suture the fragments together. There are several points to be carefully attended to during the operation, First, decide what material to use for sutures. Silver wire has been generally used for the past fifty years as the material most suitable for the permanent fixation of the fragments. When this mode of treatment has been resorted to, whatever the material used, it is with the view that it shall remain permanently. The results attained from the use of silver wire have generally been satisfactory, but in a few cases the result did not fill expectations, the wire acting as an irritant—suppuration and failure being the result.

For some years I have used chromicized catgut for sutures, and have always found it fulfilled every indication required as well as silver wire, and was free from all danger. The incision can be either longitudinal, transverse, crucial or semicircular. I favor the semicircular, with the opening to the outer side. The fragments and the joint are freely exposed, and all blood-clots from the joint, from the synovial pouch under the quadriceps muscles and from between the fragments are removed. The intervening tissue of the anterior fibrous capsule is elevated from between the fragments; the two fragments are refreshed by being scraped. The drill is now made to perforate the upper and lower fragments (care being taken to have the point of the drill emerge from the lower surface of the patella just above the lower cartilaginous surface). If silver wire is used when the fragments are in apposition, it is twisted, cut off and hammered

down upon and into the tissues over the line of fracture, chromicized catgut being used, passing it through the drill holes of the upper and lower fragments; they are brought snugly together, the ligature is then tied. The aponeurotic fascia and soft tissues in front of the patella are nicely sutured, which procedure hermetically seals in twenty-four hours the front of the joint from any discharge infiltrating through the tissue made by the fracture from the soft parts over the front of the patella. All loose pieces of tissue are removed, and any torn or lacerated shreds are cut away. The semicircular flap of integument is now sutured and the line of incision is closed. The linear incision can be painted over with a layer of styptic collodion and then dusted over with iodoform, after which a posterior splint and other external dressings are applied in the usual manner.

The success of this operation depends wholly upon conscientiously carrying out the smallest details of antiseptic surgery.

DISCUSSION.

Dr. W. W. GRANT of Denver—The unequivocal statement of the essayist that all these cases can be treated by wiring the fragments demands consideration. While it is a fact that Lord Lister established the aseptic treatment of wiring the patella on a sound and enduring basis, I will say that I went through the wards with him in London eight or ten years ago and observed his cases, which he took great pains to explain in detail, and his practice was to use large silver wire. I never saw a case of suppuration, and always a good result. The probabilities are that he would not have the same results with the same treatment today. Yet it is a fact that the profession is not now agreed that it is wise to make a compound fracture of a simple fracture of the patella in order to wire it. As a matter of fact, the result of close ligamentous union is not bad; if the patient has not that bony substantial union that he would have

by successful wiring. It must be remembered that, in spite of antiseptic precautions, infection sometimes gets into these wounds, and if such should be the case, there will not only be imperfect union but an ankylosed joint, and surgeons hesitate very much to convert simple fractures of the patella into compound ones. I do not believe such a recommendation would be safe for general adoption. It must be admitted, too, that if the case should fall into the hands of a skilled surgeon, who is always careful to carry out every aseptic precaution, the result will be gratifying, but this will often not be the case, and if it is once generally known as the ultimatum of the profession, that in cases of considerable effusion of blood into the joint the joint should be opened, the clots of débris turned out, and the fragments wired, we are going to have some bad results follow which will bring the operation into disrepute. There is no question but that in compound fracture of the patella, the patella should be wired at once. In those cases where we have considerable laceration of the soft parts, extreme distension, with effusion of blood, it is wise to open and turn out the blood-clots; but in cases seen around the elbow-joint these can be dealt with very well by aspiration. At the present time it is hardly a safe dictum that we should convert simple fractures of the patella into compound ones for the purpose of wiring the fragments together, in order to get bony union, while under our present methods of treatment we can secure close ligamentous union with very good results.

Dr. Fred J. Hodges of Ashland, Wis.—The essayist failed to drawn a distinction between those fractures produced by direct violence and those produced by muscular effort. It is well known that osseous union is practically unknown in those injuries which are produced by muscular action. This field of surgery was illumined by the work of Macewen, who in 1883 called attention to the fact that in fractures caused by muscular action, the posterior thick and elastic covering of the patella stretches before it gives way; that these fibrous bands are brought into apposition when the fracture is reduced, causing a heterogenous new-tissue formation at the site of fracture, that is, fibrous tissue between the two bony surfaces. In such cases the main consideration is not so much the suturing or the method by which the fragments are approximated as it is

the removal of this incarcerated fibrous material from between the fractured ends which is interfering with bony union. To become dogmatic and say that every such case should be operated upon, is going too far, as is shown by the course of the eminent authorities now in charge of the case of the Prince of Wales. He is under the care of Macewen, who practically originated suturing the patella, but is being treated by the older methods. There are certain conditions of the body of the royal patient which contraindicate his being treated along the operative line.

In fractures produced by direct violence there is comminution, but no stretching or incarceration of fibrous tissue, and in such cases we may reasonably expect firm bony union from any method which will bring the surfaces of bones into apposition. Intervening fibrous tissue must be removed if you seek bony union, and incarceration of tissue always occurs where the injury is the result of muscular action, which, of course, constitutes the great majority of such injuries. A body which would become authoritative in its field could hardly commit itself to the proposition that every case of patellar fracture should be operated upon, and to that extent I take exception to the paper.

Dr. W. J. Mayo of Rochester, Minn.—I was very much pleased and interested in Dr. Jay's paper. Dr. Hodges struck the keynote when he said that in those cases of fracture of the patella caused by indirect violence the difficulty in securing union is from the interposition of fibrous tissue between the broken fragments. Macewen gave us the reason why in some cases of fracture of the patella we had considerable separation of the fragments and still good functional use of the joint secured. It is because that portion of the anterior ligament, of which the patella is but a part, is separated, while the lateral expansion of the tendon holds the joint in good position.

Another point to be considered is the best time for operation. The knee-joint is a good deal more dangerous than the peritoneal cavity, the reason for which is its liability to infection. In addition to that, it has not nearly the power of protecting itself that the peritoneal cavity has; it has not the lymphatic supply. If we get infection of the knee-joint, we may not only lose the joint but the patient's life. A slight infection of the

peritoneal cavity would be harmless as compared with a similar infection of the knee-joint, for the reason that nature has not prepared that protection by which she provides a certain immunity from infection and traumatism in the peritoneal cavity. As to the time for operation, we will be governed largely by the condition of the skin. If the skin is not bruised we can operate at any time, but if it is bruised or covered with blisters, on account of the liability of carrying infection into the joint, surgical intervention should be delayed until a more favorable opportunity presents itself. In connection with operation, I do not think the finger should be allowed to touch the wound. Soiled fingers, which can not be avoided in the peritoneal cavity and are practically innocuous under ordinary circumstances, in the knee joint prove dangerous. The method of working entirely with instruments is good, sound surgical practice.

Dr. JAY (closing the discussion)—I do not know that I have anything in particular to say in my closing remarks. Probably most of you consider the paper a little radical. However, as I said in my paper, when there is a fracture of the patella, with pain in the joint, effusion of blood and synovial fluid in it, ecchymosis, etc., I have no hesitation in opening into the joint, cleaning out the débris, stitching the fragments together, believing that I will have a good result. I call it good surgery to do this. If the lower end of the patella is broken off, does not penetrate the joint, and there is no effusion of blood or of synovial fluid into the joint, there is no necessity for opening the joint. It is not good practice to let a knee-joint filled with extravasated fluid or blood with fibrous tissue incarcerated between the fragments go unoperated. By external applications you can not get the fragments together, nor would you get bony union in such a case if the fragments could be brought into apposition. The interposition of fibrous tissue or of other material between the broken bone certainly prevents you from bringing the fracture in apposition.

Dr. GRANT—What would you do in a case where there was no interposition of material between the fragments and there was simply effused blood?

Dr. JAY—You do not wait for the interposition of fibrous tissue. I have operated on fracture of the patella for the last

fifteen years, and I have never had an unfavorable result. Before I had carried out the treatment I have described I had the fragments one and two inches apart, particularly in the cases of old men, and they needed a support all the time. I do not operate on every fracture of the patella where the knee-joint is opened, the aponeurotic structures are torn, and there is an effusion of blood. I have had three cases in the last six months in which the fractures were caused by external violence. These were railroad cases. In one case in particular, the fracture of the patella was caused by a railroad tie falling on the man's leg. I did not see him for five or six days after the injury, at which time the knee-joint measured twice what its fellow did. I could not tell definitely whether there was a fracture or not at that time. He was brought to the hospital, hot antiseptic fomentations were applied to reduce the swelling, and then an incision was made, through which a pint of clotted blood was turned out of the knee-joint. The cavity of the joint was irrigated with boracic acid and bichlorid, the tissues washed and rewashed until they were thoroughly cleansed, and the patella sutured. This treatment was followed by a excellent result in this case.

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THOMAS B. LACEY, M.D., SECRETARY.

CONSERVATISM IN RAILROAD SURGERY.

BY H. HATCH, M.D.
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The paper I present here contains two merits: 1, its shortness, and 2, a subject that can not be too often brought before surgical bodies, and that is, the saving of injured parts, a subject of great and deep interest to patients suffering from surgical injuries, and also of great importance to every conscientious surgeon. Not a few of us are often confronted with injuries of the upper and lower extremities, where, in order to be sure of the wound healing by first intention, we must remove so much of the injured member that when it is entirely healed it becomes perfectly useless. Injuries such as these we often find as the result of railroad injuries, and we meet them also in planing-mills. Very often by the pulley action upon the distal ends of muscles they are loosened at their insertion, and thereby, if left, in the process of healing they set up a phlegmonous infiltration, or inflammation, in spite of all our precautions.

It should always be the object and aim of the surgeon to leave the injured member in such a condition that when it is healed it will be of some use to the patient in future life. Often the surgeon will find, if he does this, that by taking the chances to save parts that are badly bruised and torn for the sake of their ultimate usefulness, sloughing takes place, and he will

be very much blamed; and especially so when some meddlesome neighbor or "kindly physician" in the neighborhood tells the patient's friends and relatives that if the wound had been properly treated no sloughing would occur; but sloughing will occur if dead tissue is left. If there are such kind friends there very frequently is no end to the troubles of the surgeon.

The first consideration of a surgeon, when called to a case, should be: How can I operate so that this patient can remain a useful member to his family and society? And especially should his thoughts revert to the family, because most injuries of this kind occur to mechanics and men who depend upon their labor for their daily bread. It is never necessary to think, in making an operation, whether it shall be a McKinzie, a Henry, or a Symes operation, and I never do think of that. I always think: How much can I save of the part to make it useful to the owner? To illustrate the point I have in view in the above remarks, I will give a case that I had not a great while ago:

William F., a carpenter by trade, while working with a machine called a planer, had his left hand cut. This machine has a cylinder upon which are a number of knives that revolve with great velocity. His hand was caught, palmar surface upward, crushing all the phalanges, also one-half of the distal ends of the second, third and fourth metacarpal bones. The end of the first metacarpal bone was also laid bare, and the extensor tendons had all been severely pulled upon. In this case my associate thought it was useless to try to save any portion of the hand. I think most surgeons would have amputated on a line just at

the base of the thumb. I did otherwise. I took a flap from the posterior part of the hand and brought it over the bare end of the first metacarpal bone, after first having sawed off the roughened and lacerated ends, directing it in such a way as to have a pointed stump; and in that way have made a very useful hand for him, so that he is able to do almost anything that comes to him in the line of his trade. In order to save the portion of the hand that I saved for him—the end of the first metacarpal bone—I took a great risk, with my badly bruised and very much disorganized flap. As will be readily seen, there is left a bad scar. This was the seat of extensive sloughing on the palmar surface of the hand, but there still remains a fair amount of grasping surface between the thumb and the end of the first metacarpal bone. Without the projecting end of the first metacarpal bone this man's hand would be useless; but had I amputated it higher up I would have saved myself an immense amount of trouble, and have gotten more praise for having my wound heal quickly, and by first intention, but now the patient is glad I took the risk that he might have a useful hand.

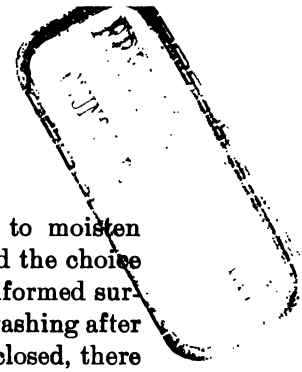
More recently I had a case which was simply remarkable in its results—a case of a mechanic, where the first, second and third fingers were crushed to such a condition that I removed a number of small pieces of bone, washed the parts thoroughly with alcohol, bound them up loosely with gauze, and upon each finger put a splint, thinking that, if necessary, amputation could be made; later the fingers all healed and the hand is useful today.

Another case, remarkable as an illustration of con-

servatism in railroad surgery, is one which I reported in the *International Journal of Surgery* last year—the case of a fireman, where there was a compound comminuted fracture of the femur of the right leg with rupture of the quadriceps extensor muscle, foot of the same leg crushed, and fracture of the left leg above the ankle. It would seem as though it would have been impossible to save this man's right leg, but he is well today and firing his engine as usual. In the Army and Navy Surgical Medical Museum at Washington, on the second floor of one of the departments of the museum, there are a number of specimens in plaster, illustrating cases very similar to the ones I have just referred to.

To illustrate the latter still further, I give another case, a gentlemen, where I took a great deal of chance in saving the index finger. It was an instance where the man, in operating what is called a band saw, had the entire outer aspect of his hand caught, the saw passing through the fifth, fourth, and third metacarpal bones near their distal extremities, then passing a little forward and entering the base of the first phalange of the index finger. It looked a hopeless task to save this finger; but by great care in stitching the wound together, after first amputating enough of the distal extremities of the metacarpal bones of the outer portion of the hand, I was able to save this finger, and also to make it a useful member. I might multiply these two cases by a number of others that have recently come to my mind, where it became necessary to take risks in order to make useful parts.

And now, one word as to dressings. In these bad cases, where the tissues are badly lacerated and torn,



I find nothing better to my mind than to moisten dressings with an antiseptic solution; and the choice of that antiseptic can be left to the well-informed surgeon, but I want to say that for the first washing after an amputation and before the wound is closed, there is nothing better than pure alcohol. Since I have been using alcohol freely in washing out wounds I have had much better results than formerly.

REMARKS ON THE RADICAL CURE OF HERNIA.

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The retention of the abdominal contents depends upon the muscular and aponeurotic structures. The skin and the peritoneum are the natural coverings of a hernial protrusion, and have little or no value in preventing their occurrence, yet each is a factor in the result, which can not be ignored.

One prolific cause of failure is suppuration in the wound and resulting formation of relatively weak scar-tissue in place of normal union, and for this the skin is largely responsible. At this time, when the material for the sutures, instruments, and dressings can be sterilized beyond a doubt, the fingers of the surgeon and the patient's skin are the recognized sources of danger.

By the constant use of instruments and protecting the fingers with gauze or a rubber finger-cot, or by the use of rubber gloves, in slight necessary fingering of the wound, hand infection can be reduced to a minimum, but by no means can the patient's skin be rendered reliably sterile. The white skin-germ has its normal habitat in the sebaceous follicles, and an

occasional suppuration from this cause can not be avoided.

A frank recognition of the impossibility of such efforts and the adoption of more careful handling of the skin to preserve the normal power of resistance, I believe, will lessen such unfortunate results.

The skin, as a rule, is over-prepared, the surgeon, humiliated by such suppuration, redoubles his efforts, and the skin suffers—too often the prolonged poulticing with green soap, bichlorid packs, scrubbing and shaving on the previous day, sends the patient to the operating-room with the wound-site covered with red points, where the white germ is already at work in the irritated skin.

From personal experience I can say that, since I abandoned these methods, two years ago, primary wound-healing has been of almost constant occurrence. The wound-site is prepared the morning of the operation by a careful scrubbing with soap and water, using a piece of gauze and not a stiff brush; it is then shaved and covered in the usual manner. The scrubbing is repeated on the operating-table, with the addition of turpentine, if the skin is very oily, and followed again by soap and water, and the wound-site is then hardened with alcohol.

In suturing the skin, careful avoidance of tension is of the utmost importance. The subcuticular suture gives a very beautiful scar, but if a stitch abscess is formed, the pus will run under the whole length of the wound, which may not be the case with the ordinary methods of closure.

The ingenuity wasted in dealing with the peritoneum has been enormous, the formation of buttresses

or peculiar method of handling a membrane, which is notoriously impotent to aid in holding back the protrusion, is a waste of time. The only object in view is to prevent this membrane from insinuating itself in between the muscular and aponeurotic structures and preventing the union of the real retentive agents.

The late Greig Smith says, in speaking of the avoidance of hernia after operation, "that scar-tissue is always unreliable, and if possible should be protected by normal structures." The correct application of this principle is shown in the McBurney or the Kammerer incision for the removal of the appendix. In this connection Kocher has pointed out that incisions along natural lines or creases not only give better cosmetic results, but are also along lines less subject to pressure with corresponding diminution of hernia. Bevans' incision for operation upon the gall-bladder is a fine example of the advantage to be derived from this method.

In the proper management of the muscular and aponeurotic structures lies the cure of the hernia, and every means of dividing the necessary scar-tissue into different planes, protecting each part by sound tissue, as in the Bassini operation for inguinal hernia, is of the utmost importance.

Great care should also be taken in the avoidance of tension in tying the sutures, and only enough to bring the parts in apposition should be inserted.

In the use of retractors the assistants should be cautioned to handle the tissues gently and avoid injurious traction.

Incisions posterior to the line of the colon in its fixed portion are less liable to hernia, as Theodore

McGraw has pointed out, both because the muscular tissue is thicker, and also because the colon lying in front of the scar prevents the small bowel and omentum from wedging itself into the opening.

In operations for appendical abscess, if only drainage is instituted, the opening can often be placed well back with less liability of hernia, although the appendix may require removal later. If the appendix is removed in these large abscess cases, the patient is well rid of a serious problem, but quite likely will have a hernia to deal with later.

Inguinal hernia.—Bassini's operation exhibits in a striking manner the correct application of the principles involved in all hernial operations; instead of a scar in one plane from within out, which was the weak point in previous operations, he divided the scar into two parts and protected each by normal tissue.

The internal oblique and transversalis muscles and fascia are sutured under the cord to the inner surface of Poupart's ligament, and this line of sutures is protected by turning Poupart's ligament back into its place over the cord, while the line of suture reuniting the divided fascia of the external oblique is protected by the sound tissues drawn underneath, the resulting union being not only edge to edge but side to side, furnishing broad surfaces for union.

As pointed out by William B. Coley, one suture should be introduced above the new internal ring in the deep layer of sutures as well as those below; this limits the extent of the opening and prevents stretching above, under pressure.

Postemske modified Bassini's operation by bringing the cord directly through the external oblique, at the

site of the internal ring. This has been followed by many operators. In my experience it has proved an objection, as I have seen a number of failures wherein the relapse occurred at this opening, and even when the internal ring is protected by the fascia of the external oblique, as in Bassini's method, the relapse seldom follows the cord but tends to bulge directly through, stretching and thinning the tissues over the internal ring.

Lucas Championnière has observed that nearly all operations for radical cure will show a moderate impulse on coughing, and that this is not an indication of impending relapse.

We have made the typic Bassini operation more than 100 times, and the results have, with few exceptions, been good. We have abandoned kangaroo tendon for catgut sterilized by the Boeckman dry heat method, and are perfectly satisfied with the results. Several years ago I performed the Halsted operation a number of times. It is a very good method and ranks next to the Bassini. The disadvantage is that the scar-tissue lies in a single line from within out. The mattress stitch brings broad surfaces into apposition, and the weak scar-tissue is protected by permanent buried sutures of silver wire acting as an internal splint. The results were good, but occasionally, even after months, tissue atrophy over a wire suture rendered its removal necessary.

The original McBurney operation, which sought to give a great mass of scar-tissue to protect the hernial opening, has been abandoned by its distinguished originator, and justly so in non-strangulated cases, as it represents a transitional stage in the development

of better methods; but I have occasionally found it very useful in gangrenous hernias, where it was necessary to use a drain. Ordinarily such a case is almost certain to relapse, but treated in this way a considerable percentage of permanent cures can be obtained, and at the same time good drainage is secured.

R. H. M. Dawbarn proposes and practices the burying of the testicle behind the muscles, thus leaving an unbroken abdominal wall. This procedure will not prove popular, but in cases complicated with undescended testicle it is a valuable suggestion, at once placing the testicle out of harm's way, and relieving the operator of an awkward factor in the cure.

Operation for the cure of relapsing hernia has been very troublesome; by the time you have raised the cord from its bed you justly wonder if there will be life enough to nourish the testicle. While on a recent visit to New York, through the courtesy of William T. Bull, I saw him operate on several hernias in children. In one case he did not raise the cord from its bed at all, but picked the sac from it, tied and sutured the deeper muscles over the cord to the under surface of Poupart's ligament, and over this sutured the fascia of the external oblique in the usual manner of the Bassini operation. In operating on relapsing hernia this idea is most excellent, and saves much time and annoyance in raising the adherent cord from its bed.

The relapse, in my experience, is usually a direct protrusion and does not follow the cord, the coverings being thinned and stretched muscular and aponeurotic structures.

E. Wyllys Andrews, in his modification of the Bas-

sini operation, sutures the inner edge of the incised fascia of the external oblique with the internal oblique, transversalis, and Cooper's fascia below the cord to the under surface of Poupart's ligament, suturing the external edge of the flap over the cord to the surface of the external oblique muscle in an overlapping manner.

As there is a redundance of tissue, this plan of suturing in relapsing hernia is an advantage, as it shortens the tissues. In this way I have quickly and satisfactorily operated upon four relapsing hernias. Dividing the external oblique fascia to a point above the internal ring and loosening the outer flap only, to expose the under surface of Poupart's, the peritoneal sac is encircled by a purse-string suture, and either cut away or reduced and the suture tied. All of the tissues, excepting the skin and superficial fascia, are sutered *over* the cord to the under surface of Poupart's, and the external flap of external oblique overlapped and held by an extra row of sutures.

The external oblique has a larger range of motion than the inner muscles, and may be said to act as a sheath for them. This allows of overlapping during the repair of hernial openings at almost any point in the abdominal wall, and greatly aids the strength of the union.

In both the inguinal and femoral operations the bladder may be drawn with the sac into the wound and injured. In one such case I incised the bladder freely before I discovered the accident. Since that time I have been on the watch for this complication, and have a number of times been compelled to carefully dissect the bladder free from the neck of the sac.

Femoral hernia.—My experience in the radical

cure of femoral hernia has been favorable, although, from the nature of the femoral canal and the character of its walls, permanent occlusion would seem to be a difficult matter. In small hernias I have been satisfied with a method employed by B. F. Curtis, consisting of three superimposed circular purse-string sutures of catgut, the first at the internal femoral opening, the second one-third of an inch outside of this, and the third at the external surface of the canal. For some very large hernias the method is not suitable. For these cases I have divided the external face of the ring outward and upward, separating the iliac portion of the fascia lata from Poupart's, then passing a series of mattress sutures through Poupart's ligament one inch back of its lower margin, and catching the pectineus fascia with the inner sutures and the iliac portion of the fascia lata with the outer sutures near its cut edge; drawing these sutures tight, slide the lower fascia under Poupart's ligament; the latter acts as a flap and can be sutured by its lower margin to the tissues below.

A. J. Ochsner lays great stress on removal of a part of the omentum in these hernias, whether adherent or not, as he believes that the omentum is the entering wedge, and, if sufficiently shortened, can not in the future reach to the femoral opening.

One peculiarity of femoral hernia is the amount of fat lying external to the sac, and which by the constant congestion may develop a true lipoma.

In this region will occasionally be found small hernial openings through Poupart's ligament, in the vicinity of the femoral ring, but not through it. They greatly resemble the small ventral hernia in the linea alba above the umbilicus.

According to Sutton, such hernias are caused by a slight separation of the aponeurotic fibers through which a little fat tag escapes. The irritation favors a lipomatous condition, and by traction a peritoneal pouch is drawn through. Closure is readily affected by direct suture, as there is little tendency to relapse.

I have had no occasion to try the so-called inguinal operation for the cure of femoral hernia.

Umbilic hernia.—This form of hernia has been the hardest to cure. Usually found in very corpulent people with small muscular development, the conditions are naturally unfavorable. The advice is usually given to cut back on each side to the recti muscles. In two of my earlier operations, in attempting to follow these instructions, I trimmed back each side several inches before finding muscle fibers, impossible to draw to the median line. In both of these cases I was compelled to suture the wound transversely, and, contrary to my expectation, the results were just as good as in the ordinary manner of suturing.

If the patient be laid upon the table and then requested to rise, the action of the recti will clearly show their position and indicate the feasibility of attempting to draw them together in the median line. In a few cases I have been able to do this, and by tier suturing had fine results. Should the distance be too great, I have again used the flap method with the utmost satisfaction. After freely removing the umbilicus and attached sac, I have cut the ring upward and downward an inch or more, and cleared the aponeurotic structures on each side for at least two inches.

Mattress sutures of silver wire are introduced an inch to an inch and a half from the margin of the

aponeurosis on one side, and one-fourth of an inch from the margin on the opposite side; when these are tightened it draws one side beneath the other, the overlapping edge being sutured to the surface of the opposite aponeurosis. As no sacrifice of tissue has been made, the overlapping is readily done. C. P. Noble uses a somewhat similar method in closing celiotomy incisions.

In operation for umbilic and ventral hernia the suggestion of Joseph Ransohoff, that the incision be carried into the abdomen on either side of the umbilicus and sac, is a good one, as it allows the hernia to be drawn out and inspected from the inner side, and saves a tedious dissection.

The little ventral hernia above the umbilicus in the median line can be easily closed in a similar manner, and in eight cases, in the experience of the writer, has relieved chronic gastric pain of long standing.

Buried silver-wire sutures in the upper part of the abdomen have not given me the after-trouble which I referred to in speaking of their use in inguinal hernia; although I limit the use of non-absorbable sutures to large umbilical and ventral hernia, where tier sutures are clearly inapplicable.

Post-operative hernia.—From drainage and other causes these hernias can not be avoided. If of small size, tier suturing has given good results, but if of long standing and considerable size, with attenuated muscle at the margins, the flap or overflapping method as applied to femoral and umbilic hernia has proved quick and satisfactory. By this means the scar is divided into halves, and each line of sutures is protected by normal sutures.

If the nature of the tissue is not good, buried mattress sutures of silver wire, applied after the method of William S. Halsted, give permanency to the closure.

Before operating upon large hernias, which are not readily reduced or only partly so, rest in bed with a limited diet for one or two weeks before operation is a good plan.

I have several times seen great distress and even dangerous symptoms follow the sudden return of the contents of large hernial sacs to the abdomen.

In old men, with large inguinal hernias, if the foot of the bed be raised for a week before and a week after the operation, the abdomen becomes accustomed to the presence of the hernial contents before its permanent reposition; and after operation less strain is brought to bear upon the sutures.

If there be enlarged prostate, castration can be done at the same time, and relieves the subsequent urinary straining, which not infrequently caused the hernia. In all operations upon this class of cases the removal of considerable quantities of omentum will lessen intra-abdominal tension.

Young males with phimosis should be circumcised, to prevent straining, before leaving the hospital; but on account of the proximity of the wound on the penis to the hernial wound and the increased restlessness of the child, it is not best to do them both at the same time.

We have kept the ordinary hernia cases in bed for three weeks, and have used no mechanic support afterward.

With large umbilic and ventral hernias, four weeks in bed has been considered the shortest time advisable, and if the patient is very corpulent, an abdominal

supporter has been advised for at least a year. During the past ten years a total of 243 cases have been operated upon by myself and my brother, C. H. Mayo. Previous to this time the operations made were entirely for the relief of strangulated hernias, and attempts at a radical cure were crude and unsatisfactory. Of these operations 180 were made at St. Mary's Hospital, Rochester, Minn.; eleven at the first State Hospital for the Insane, at St. Peter, Minn.; twenty at the second State Hospital for the Insane, at Rochester, Minn., and thirty-two cases outside of these institutions. This includes strangulated hernias in which radical cure operations were performed. In the first four years but thirty-nine cases were subjected to operation. Failures were numerous, and it was not until about six years ago that increased experience led to more systematic work.

Since January 1, 1893, an attempt has been made to find out the number of relapses, and while this could not be done with exactness, the sources of error are less in a fixed agricultural community than would be possible in a large city.

Of the 204 cases operated upon in this period 164 cases were inguinal, with five known relapses; sixteen cases femoral, with no known relapse; seven umbilic, with one known relapse; eight ventral, with no known relapse. In no case was the relapse complete.

In this series, one case of incarcerated femoral hernia in an insane patient, at the Rochester Hospital, died of external wound-infection. This may have been an autoinfection, as the patient would eat her feces unless watched for months before the sudden incarceration demanded relief.

One case of inguinal hernia, at St. Mary's, died of broncho-pneumonia during the second week. This wound healed by primary union.

One case of inguinal hernia, at the St. Peter Asylum, died of uremia from causes not connected with the operation, after perfect healing of the wound. Otherwise, from these cases, there have been no deaths in non-gangrenous hernia.

I am under obligation to Dr. A. F. Kilbourne, superintendent, and to Dr. R. M. Phelps, assistant superintendent of the Rochester State Hospital for the Insane, and to Dr. H. A. Tomlinson, superintendent of the St. Peter State Hospital for the Insane, for re-examination of the thirty-one cases operated upon in these two institutions, and in none of these was there a relapse.

DISCUSSION.

Dr. FRED J. HODGES of Ashland, Wis.—A discussion of this paper, in the sense of gainsaying the proposition, or of adding to it, is out of the question. Dr. Mayo has presented a paper which I believe may serve the Fellows as a model in every particular. A recent paper by Dr. Johnson of this city, on the treatment of hernia in old men, would appear to bear out the statement Dr. Mayo made in regard to the advisability of castration. The results in the series of cases reported by Dr. Johnson, in which castration was done at the same time that the herniæ were treated, was very much more favorable than are ordinarily witnessed in elderly patients. The Bassini method, or some minor modification of it, has made the routine radical treatment of hernia a possibility. It has diminished the percentage of relapses to practically nothing; it has robbed it of its mortality terrors, and it seems to me to be the operation not only for the present, but for the future as well. I was glad that Dr. Mayo in his paper spoke of the suture material, and I am gratified to know that some one has secured a method of sterilizing catgut which is thoroughly reliable. I shall be encouraged to renew the use of Dr. Boeckmann's catgut upon

the recommendation of Dr. Mayo, as contained in this paper.

Formerly, when scar tissue was depended upon to retain the gut, some writers brought forward another element in the formation of hernia, i. e., elongation of the mesentery. Dr. Mayo has, and I think properly, disregarded it. If we have recurrences, we must take the fault to ourselves as indicating an imperfect approximation of sound tissue against sound tissue in closing of the hernial wound.

I am afraid that Dr. Mayo will considerably curtail discussion on his paper by the extreme thoroughness with which he has presented the subject.

Dr. ARTHUR D. BEVAN of Chicago—I have had over 140 cases of hernia in which radical treatment was resorted to for its cure. In that series I have had one death from delirium tremens, but no deaths from any other cause. I have learned this (and it has been emphasized and hammered into me during the last year and a half), that there is one class of cases of hernia where we should be careful about giving a favorable prognosis as to the permanency of cure, and that is in fat people. I have operated on four very fat men in the last year and a half, and every one of those cases has relapsed. I do not refer now to the ordinary, rounded-out specimen of a man, but I mean fat people. One of those patients weighed about 250 pounds; another 220 pounds, and all were individuals of that type. I am satisfied that the operation in all cases has been of great service, because none of the relapses are bad, whereas before operation it was impossible for them to wear trusses with any comfort. Those cases are now comfortable and the individuals are satisfied. I would be careful in making a prognosis as to the permanency of cure in fat individuals, because evidently their tissues are of a character that do not well bear the great intra-abdominal pressure which exists in those cases. Those of you who have operated upon individuals weighing 250 pounds, know that it is a good deal like operating in oil, in that all of the tissues are saturated with fat particles; the aponeuroses of the muscles themselves are saturated with fat.

The other point I desire to make is in regard to the use of silver wire. I do not believe in using any suture that is not absorbable. I have taken out silver wire sutures, that were put in by very eminent surgeons, after such cases have been

reported as perfect and permanent cures. I have not only removed silver wire but also sutures of silkworm gut and the like. Wherever we can possibly avoid the use of silver wire in operations on hernia, we should do so, substituting absorbable suture material, not only because you have to take the silver wire out, but because if you subsequently make a dissection of a hernia where silver wire has been used and where it has apparently answered the purpose thoroughly, and the wound heals aseptically, if you make a dissection of the scar of such a case, you will find the silver wire suture is either to one side or the other of the incision. I simply call attention to this fact.

Dr. D. S. Fairchild of Clinton, Iowa—The Doctor has treated this subject so exhaustively in his paper that it gives one very little opportunity of saying anything. However, I wish to state that I had an opportunity of seeing some of the Doctor's work last spring, it being a case of umbilic hernia in which the flap operation was made. I was much interested in it because of the usual difficulty in getting a cure in this form of hernia from the ordinary operative procedures. Dr. Mayo in this case used silver wire, and if I understand his position rightly, he uses silver wire in that class of cases where he wants to hold the flaps together in a very firm manner for a considerable period of time. It does not make much difference to which side the silver wire ultimately gets, if it holds the parts in apposition until we get firm union of the abdominal walls. I was glad to have listened to that part of the paper, and I would ask the Doctor to indicate a little further the result of the case I had an opportunity of seeing him operate on last spring.

Dr. Edward Dooley of Buffalo, N. Y.—I have treated several cases of umbilic hernia, and I think it is absolutely necessary to use silver wire in these cases. Most of the cases of umbilic hernia occur in people that are stout, and I think it is very necessary to renew the anchor sutures, the ones that hold the heavier part of the tissues together. I had one case in particular about three years ago, in a woman 38 years of age, whose hernia was as large as the crown of a Derby hat, and the opening as large as a silver dollar. When I came to operate I found that the transverse colon was adherent to the sac for nearly eight inches, so that it was with considerable difficulty that

the sac was removed from the transverse colon. She made a very nice recovery. I used silver wire sutures, as I always do. For buried sutures I use catgut, and for the others silkworm gut, which I remove.

Dr. ARTHUR D. BEVAN of Chicago—I desire to say that I would not be understood as criticising the use of silver wire in cases of umbilic hernia. I am emphasizing the point, from my own observations, that where we can avoid non-absorbable sutures, it should be done, simply because we or some one else will likely have to take them out. I have an assistant upon whom I operated for the radical cure of hernia. He has six or eight silver wires in his inguinal tract and while there has been no suppuration, these wires give him considerable pain from time to time, and are a source of annoyance. Wherever we can avoid their use, it seems to me we should do so.

Dr. R. HARVEY REED of Rock Springs, Wyoming—I desire to corroborate what Dr. Bevan has said in reference to non-absorbable sutures and to state that my experience has been in accord with his. I use non-absorbable sutures as described in Dr. Mayo's paper, that is where they are to stay for a certain length of time, and be removed later. The idea of burying these sutures and expecting them to remain permanently without causing infection is not sound; they are bound to give trouble sooner or later. We had an enthusiast on silver wire in the Ohio Medical University, in the person of Dr. B., who used it very extensively, and in almost every case in which he buried his silver wire he had considerable trouble later. The patients would complain of pricking pains and to avoid that he put in interrupted sutures and bent the ends down. The patients complained of pain along the line of suture and of tenderness along the line of adhesion, and then he changed to putting in longer sutures, but with the same results, and as Dr. Bevan has said, in making secondary operation we find the silver wire at one or the other side of the original wound, having cut through.

As to umbilic hernia, I have a case I expect to report by-and-by in which I have hesitated a little making a prognosis, although it is some nine months since the operation. The woman was very fleshy, weighing nearly 300 pounds, and the

umbilic hernia was so large that sitting it would almost reach to her knees, being of many years' standing. When opening the sac I found it to contain a portion of the ascending colon and a good portion of the omentum. The opening in the abdominal wall was large enough to admit the fist easily. I removed about three pounds of omentum; loosened the ascending colon and anchored it to the abdominal wall with fine catgut sutures. The abdominal wall was three inches in thickness, so I freed the muscles from the fatty tissue, freshened the edges and brought them together with heavy catgut sutures Then I found I had on each side of the wound about two and a half inches of integument more than I needed. This was trimmed away to fit the wound, and make the belly a little more snug, and sutured with silkworm gut. I had union by first intention, and at the present time, about nine months since the operation was done, the woman has not had any return of the hernia. I had a Hamilton supporter made for her which she wore for a month, became disgusted with it, and threw it away, and she now goes about without anything. I saw her a few days ago and the hernia has not returned. I am fearful, however, that it may do so. My experience goes to show that in very fleshy persons we should be very guarded in our prognosis as to the permanency of cure.

Dr. MAYO, closing the discussion—I would like to say that I believe there are a number of good methods of sterilizing catgut. I think the von Bergmann method of chemic sterilization will give good results, also the formalin method. The dry-heat method, introduced and adopted in this country by Dr. Boeckmann, is the one I have used. Dr. Boeckmann lives in Minnesota, and I became acquainted with his method of sterilization early and have used it for more than four years. If you do not use any of these methods for sterilizing your catgut, it is better for you to buy it and sterilize it yourself, as you can not depend on commercial catgut. With a dry oven and a Bunsen burner, you can regulate the heat. If the catgut needs drying, begin by drying it at a low grade of heat and gradually raise the temperature, little by little, until you reach the boiling point. If the catgut is rendered absolutely dry before you heat it, it will stand any amount of heat. I have heated it at a temperature of 300 degrees and held it

there for hours. We make it a rule to sterilize it at from 280 to 310 degrees, and hold it there for six or seven hours. Of course, this is not the only method, but there is no conjecture about catgut that has been subjected to this degree of heat.

Dr. HODGES—How do you preserve the catgut after that?

Dr. MAYO—It is folded up in oiled paper, and each ligature is placed in an envelope by itself before heating. I have used this method of sterilization so long that I have absolute faith in it. Drs. Bevan and Reed spoke of the use of silver wire. I distinctly stated in my paper that I had never seen any trouble from it when it was used in the upper part of the abdomen in fat people. (Here Dr. Mayo went to the blackboard and demonstrated certain points in the technic of the method he had described.) This method can be done in cases of femoral hernia; it can be resorted to in hernias following appendical operations. The same thing can be done in a modified operation for relapsing hernia.

THE TRAUMATIC INJURY OF PERIPHERAL NERVES.

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Peripheral nerve injuries constitute a very interesting chapter in railroad surgery, on account of the uncertainty of the remote effects on the nerves themselves and on the organs and parts supplied by them. As implied in the above statement, peripheral nerve injuries may be considered under two heads: 1, the effects of injury on the nerve itself; 2, the effects on the tissues supplied by the nerve. In fact, however, the results, so far as the nerve itself is concerned, are so closely associated with the effects secondarily induced in other tissues supplied by it that they can not be considered wholly separate, and therefore can be more properly stated as the primary and secondary results of nerve injuries. The more recent advancements in neurophysiology and neuropathology have served to clear up—from a scientific standpoint at least—much that in the recent past was obscure, and have put us in possession of much valuable practical knowledge of what may be expected in the presence of a certain state of facts.

Every variety of peripheral nerve injury may be expected in the practice of railway surgery, but they do not materially differ from such injuries occurring

in general surgical practice, except that the injuries themselves are more severely crushing in their nature. The pathologic changes which take place in an injured nerve are essentially the same in all cases, but the details will differ in certain respects. If a nerve is separated from its trophic center by division, the fiber below the point of section undergoes degeneration and is finally converted into a fibrous cord. Trophic changes in the muscles supplied by the nerve soon follow. These practical facts are well understood, and the surgeon promptly avails himself of them in endeavoring to reunite the divided ends and bring about as speedily as possibly a union and a restoration of function.

According to Strobe a down growth takes place from the axis cylinder of the central end, and the distal or peripheral end, which rapidly undergoes degeneration after division, is regenerated—at least to a certain degree—hence, if the nerve is united immediately, it is restored sooner or later with a more or less complete restoration of function. If the nerve can not be united on acçount of extensive destruction, the down growth will take place to the extent of forming a bulbous growth at the central end of the nerve, as is so well illustrated in the division of nerves in amputations, and which so frequently cause great suffering to the patient. It is important, then, to remember in an amputation that when a nerve is divided, a bulbous extremity is formed in every case as a down growth from the axis cylinder, and that in the bulb new nerve fibers grow from the old nerves, and that these are joined by newly formed connective tissue fibers. The remote difficulties which arise

from this conservative effort influence our course in relation to the management of the several nerves, particularly in their relation to the scar. Dr. Senn has suggested a flap formation in addition to the shortening of the nerve, as lessening the liability to bulbous development, particularly in patients who suffer from amputative neuromas when resection becomes necessary.

Omitting more than a passing notice of the facts in relation to divided nerves and amputative neuromas, we shall devote this paper chiefly to the consideration of injuries of nerves which do not involve their entire division.

1. Crushing injuries received by employes or others, in machinery or while engaged in various employments, involving the nerve in its continuity. In this division may be found two classes of cases: *a*, cases in which the nerve is seriously injured and is involved in the scar arising from the healing of the soft parts, or in the callus from the union of a fractured bone; *b*, crushing of soft parts in which the nerve escapes being caught in the scar but is seriously contused.

2. Strains and contusions received by employes and others, in wrecks or otherwise, which do not involve any structural change or serious lesion in the nerve and only for a short time interfere with its functions.

3. Injuries in which the peripheral end of the nerve is caught in the scar, incident to the healing of the soft parts.

Clinically, it is not always possible at first to determine just what the condition of the nerve is. The laceration of soft parts may involve also a laceration of the nerve, and in healing, the lacerated nerve may

be involved in the healing of other soft parts, and a subsequent search for the nerve may show that it is difficult to distinguish the nerve from other tissues in the scar formation, and it may be necessary to seek for the nerve at a point above the seat of injury and trace it down with considerable difficulty. In other cases the soft parts may be extensively lacerated, and the nerve escape more than a severe contusion, which, for a considerable period of time suspends its conducting activity.

In the two classes of injuries referred to the symptoms will, for a time, be essentially the same, viz., paralysis. In these cases, however, if the arm is the part injured, and the laceration of tissues is so serious that the part is kept in a state of rest, the full disability may not be discovered until the healing process is well advanced, and then it is found that voluntary movement in certain muscles is impossible. Something can be done in determining the probable condition of the nerve by ascertaining if the scar is adherent to the bone or deep enough to include the nerve, also if the reaction of degeneration is present in the muscles supplied by the nerve. If the nerve is torn across, or is so extensively lacerated and involved in the scar as to practically separate the proximal from the distal end, in the course of six weeks trophic changes will take place to such an extent that when the distal portion of the nerve is stimulated by the interrupted current the muscles will not respond. If, however, the nerve is only contused, trophic changes are less marked, and a more or less ready response to electric stimulation is found to exist.

Two patients, illustrating each of the above condi-

tions, have come under my care. The first was a case of extensive laceration of the soft parts above the elbow. After the healing of the arm had progressed sufficiently to permit of motion, it was found that paralysis of the musculospiral nerve existed, as shown by the inability of the patient to supinate the forearm and to extend the hand. The reaction of degeneration, to a moderate degree, existed. As soon as healing was complete, an operation was made to discover the condition of the nerve. The nerve could not be recognized in the scar and it was sought for at a point above the injury. On tracing the nerve down it was found so intimately associated with scar tissue that only with the greatest difficulty could it be followed. A part of the nerve to the extent of about two inches was represented only by a connective tissue cord. This portion was resected, the nerve stretched from above and below and sutured. The arm was dressed in a flexed position, to relieve tension as far as possible. But, as was expected, the reproduction of scar tissue was so extensive that the former condition of the nerve and its surroundings were reproduced and the same disability continued. I doubt if nerve implantation would have succeeded in this case, for it has been my experience that any operation for the liberation of nerves in extensive scars has been attended by failure, or at least with very unsatisfactory results, on account of the reformation of the same dense fibrous tissue, with a recurrence of the former condition. It is quite different from the union and regeneration of a divided nerve in tissue where we have only the scar tissue incident to the healing of an incised wound, or where the scar

is not so extensive as to forbid the anchoring of the nerve in normal tissue just outside the scar, so as to protect it from the multitudinous formations of new connected tissue.

In a second instance a man suffered an extensive laceration of the soft parts of the arm involving several points between the elbow and shoulder. As soon as the arm healed sufficiently to permit of voluntary movement—or at the end of the fifth week—wrist drop and an inability to supinate the forearm were found to exist. An examination showed an extensive scar over the musculospiral nerve, but the scar was not adherent to the bone, nor did it appear to be deep enough to involve the nerve. An electric examination showed that the muscles supplied by this nerve reacted well, and that there was but little atrophy of the muscles. I, therefore, became convinced that the nerve had suffered a contusion and was not lacerated or involved in the scar. I gave a rather favorable prognosis and continued the use of the interrupted current, with the result of a complete restoration of the functions of the arm in about three months.

In the second class are found injuries to nerves from strains and contusions in which there is no open wound. These cases are quite common, and are often seen in litigation. They are often seen in association with general morbid nervous states as the primary condition. The pain is frequently exaggerated and may lead to a suspicion of malingering. A careful examination will generally reveal the facts. If the pain and tenderness follow definitely the anatomic distribution of a nerve, it may safely be

assumed that the symptoms are genuine, for it is not often that the patient is sufficiently familiar with anatomy to successfully simulate pain that is confined to the nerve itself or referred, as it often is, to the nerve ends.

I have had cases under my care where a genuine nerve pain from an injury has continued for a few weeks and has led to morbid nervous states after the neuritis—which is no doubt the pathology—had subsided, and I am inclined to think these patients do not always receive proper consideration and treatment. Absolute rest is the essential treatment, and if promptly and persistently carried out, will save patients and corporations a great deal of trouble. But, unfortunately, neither the patient nor his doctor always fully appreciate the condition, and the best time for the treatment of these cases is allowed to pass unimproved.

The third class of cases includes compression of the peripheral nerves in scar tissue without the nerve itself being primarily involved in the wound, or not involved to such an extent as to destroy its transmitting functions, and no symptoms appear until some time after the wound has completely healed, when the evidences of an irritation lesion appear from the contraction of the scar tissue. If a nerve in its course is caught in the scar, the first symptoms are burning sensation, pain and numbness, followed by muscular spasms occurring at intervals, and at a somewhat later period, by anesthesia and motor paralysis below the lesion, due to interference with transmission of sensation and motion. The severity of these symptoms will depend upon the rapidity of the developing com-

pression. If the compression is slow, the nerve accommodates itself to the condition, and the more severe symptoms are much delayed in appearing. If the scar compression occurs near the peripheral end of a nerve, the interference with transmission is less noticeable and the painful impressions are the first symptoms that attract the notice of the patient.

A case of this kind has recently come under my care. A bridge carpenter suffered an injury to his right hand, due to his hand being caught between two planks. The skin was broken on the palmar surface at the junction of the thumb with the hand and some muscular tissue forced out. The wound healed promptly. About five weeks later, after he had returned to work, he began to experience severe pain in the thumb, which extended up the forearm; this was soon followed by a twitching movement of the thumb and hand. This increased in severity, and he was obliged to discontinue work. After a little delay I cut down on the nerves supplying the palmar surface of the thumb and released them from the very abundant scar tissue. The wound quickly healed. But in about five weeks the old symptoms returned and increased in severity. Thinking that my operation had not been thorough enough I repeated the operation of liberating the nerves and removed all the scar tissue. The relief was complete for about six weeks, when the old symptoms of pain and muscular twitching returned. As nothing could be expected from medical treatment, a third operation was made, which consisted in again removing the scar tissue and with it an inch of the two principal nerves supplying the thumb. This operation was followed by sensory

paralysis of the palmar surface of the thumb and a complete relief of the painful symptoms. We now entertained the hope of a cure, save the anesthesia. In this, however, we were disappointed, for in about six weeks the pain again returned, followed by extremely painful contractions of the adductor and flexor muscles, which would violently flex the thumb closely down into the palm of the hand. These spasms would frequently occur every day and sometimes twice a day, lasting from fifteen minutes to an hour, and were attended by intense pain which would extend to the middle of the forearm. Associated with these spasms was a vasomotor paralysis, shown by the dilated blood-vessels and redness of the skin. This condition would disappear on the relaxation of the muscles and the return of the thumb to its natural position.

As the pain and spasms increased in severity, a fourth operation was made, and, at the suggestion of Dr. W. J. Mayo, all the tissues, including the muscle tendons, nerves and blood-vessels, were divided down to the metacarpal bone, circumscribing the thumb except on the dorsal surface at a point three-quarters of an inch from the original injury scar. Very profuse hemorrhage followed, but in the large wound inflicted the arteries were easily secured by catgut ligatures. The wound was united simply by skin sutures and a gauze drain introduced. The painful symptoms again disappeared and remained absent for so long a time that I concluded at last relief had been obtained, and just as I was in the act of writing Dr. Mayo, congratulating him on the success of his suggestion, the man appeared in my office to tell me that

all the old symptoms had reappeared in an aggravated degree; that the pain was more severe than ever and the spasms more intense; in fact, the thumb was almost constantly drawn tightly into the palm of the hand. For short periods the spasms would relax and the thumb be restored to its proper relations. As a result of this fourth operation, the retraction of the soft parts and the maintaining of the thumb in an extended position, allowed some period of time to elapse before the parts were united by the formation of new tissue elements. As soon, however, as this had been accomplished and condensation had been reached, the pain and spasms returned. Before the painful symptoms reappeared after the last operation, the power to flex the thumb had returned, and this fact led us to hope for permanent results. After the pain returned the hyperemic condition of the skin from vasomotor paralysis still bore a constant relation to the periods of muscular spasms.

The condition demanded further efforts, and the thumb was now amputated below the head of the metacarpal bone. Skin flaps were only made. The entire length of the metacarpal was cleared of soft parts to its carpal junction, care being taken not to injure its median nerve, leaving nothing but periosteum and skin to cover it. The wound had scarcely healed when the most violent symptoms appeared; pain of the most violent character developed in that part of the hand supplied by the median nerve. The fingers supplied by this nerve were drawn into the palm of the hand for hours at a time. Sometimes vasomotor spasms existed and sometimes vasomotor paralysis. The pain would extend to the shoulder,

and the hand was in constant motion. At times the heart's action would be seriously disturbed; it would become irregular and intermittent. Gastric crises would occur, and, without nausea, the contents of the organ would be expelled. The periods of cardiac disturbance would be of short duration, but the gastric trouble would last for a week, no food being kept in the stomach, seriously interfering with nutrition and confining the man to his bed for a week at a time. During this time one-half grain morphin hypodermically was necessary, and to support the heart's action aromatic spirits of ammonia were freely used. In about three weeks, intervals of relief would come, at first for one day only; gradually these periods became longer, extending over two days, then several days. The heart improved, food could be retained, and strength was regained. At the end of three months recovery seemed to be well advanced. He exercised the hand a little in light work, but was quickly admonished by the return of some of the old symptoms, and now slight use of the hand, any exhausting influence or exposure to cold will cost him an hour of acute suffering. All the rhythmic motion of the wrist has disappeared, but there is an almost constant pain of slight degree present. The hand is slowly improving, but it is altogether extremely discouraging and causes considerable despondency at times.

The pathology of the case seems clear. A slowly developing neuritis followed the irritation lesion in the compressed nerve, and although the nerves were repeatedly freed from the scar formations, yet before the final and permanent release had been accomplished the degenerative process had extended up the nerve

to a point which our operations did not reach. The fifth operation was made fifteen months after the injury. One thing which I especially noticed at each operation was the remarkably large amount of scar tissue which formed, and its extreme density. This appeared to indicate a peculiar trophic influence exercised by the nerves. This is supported by the fact of the frequent vasomotor disturbances witnessed. The additional fact of rhythmic movement in the wrist indicated that the ascending degeneration had reached the spinal cord and affected the motor cells in the anterior horas of grey matter to a certain degree. To what extent the degenerative change has involved the cord is an interesting question. The moderate atrophic change in the muscles of the arm affords a hope that the involvement is not extensive, and we find some comfort in the fact that the movements above referred to have ceased.

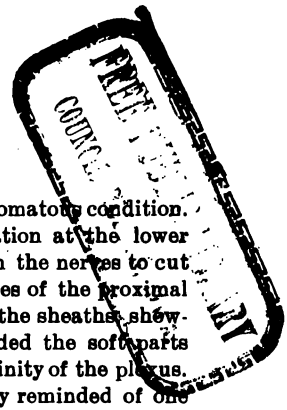
The fact that, following the early operations the symptoms disappeared, shows that extreme changes had not occurred, and, while the nerve was probably not free from some degenerative change, yet I think it is safe to assume that had the more radical operative procedures which were undertaken later been adopted at first, a much better result would have been obtained.

We have been slow in recommending any additional operative procedure on the ground that further disturbance would seriously compromise the nutrition of the nerve, which is already in a very precarious state. Our present hope is that by rest and general restorative measures the moderate improvement already realized may continue, although I have to

confess that at the age of our patient—59 years—with a distinct tendency to nerve degeneration, the prospect is not altogether brilliant.

DISCUSSION.

Dr. FRED J. HODGES of Ashland, Wis.—The Academy is to be congratulated in having a paper of this character presented before it. It is a departure from the stereotyped form of papers upon surgery of the peripheral nerves, and brings up a highly interesting case. In speaking of the injuries to which the nerves are susceptible, I would like to include in the Doctor's classification the incarceration of the nerve within the lines of fracture, not simply in the callus. But there are a certain number of cases of fracture in which there is developed, almost immediately, an intensely painful condition, and care ful manipulation will discover that the nerve is incarcerated within the line of fracture. Failure to interpret this condition has led to amputation. The description of Dr. Fairchild's case, which he has given us fully and clearly, recalls to my mind one or two cases of the same nature. The point of similarity was that it was a lacerated and extensive wound, caused by the application of a very considerable degree of force. One case was a multiple fracture of the forearm, which was caused by a blow from a log. After the healing of the fracture, there was considerable pain, particularly over the musculospiral area. The arm was examined by a number of physicians, and finally was amputated by Dr. Reinhart of Ashland, on the advice of Professor Herdman of Ann Arbor, against his own judgment in the matter, however, so far as relief of the condition was concerned. Later the man came to Dr. Senn, who dissected down upon the stumps of the nerves in the axilla and removed them. A few weeks ago, we cut down again into the axilla and traced the nerves to their origin in the plexus, and divided them close to the plexus. There is now the same intolerable pain that there was at the time the bone first healed, and it is still referred to the palm of the hand and the wrist. A possible explanation of these cases may be this: The injury tears the more resisting nerve, not at the point at which the bone or the muscles give way, but from its insertion or origin in the plexus, and perhaps all the axis cylinders are destroyed. Some of the



cylinders may recover, others produce a neuromatous condition.

In another case, which required amputation at the lower part of the arm, in endeavoring to pull down the nerves to cut them short in the stump, eight or nine inches of the proximal ends of the nerves were easily pulled out of the sheaths, shewing that the injury which so smoothly divided the soft parts had also divided the nerve well up in the vicinity of the plexus. In the description of the case I was forcibly reminded of one which Hughlings Jackson mentioned in his Lumleian lectures of 1890. There he describes what he calls convulsive seizures, and locates them in three levels in the cortex—the first and second in the subcortical areas and a third in the cord. His explanation of the case would be, according to this plan, a convulsive seizure of the third or lower level, and whether or not it could be explained on the ground of a peripheral reflex theory, or whether it was, as the Doctor has suggested, simply a degeneration extending up the nerve until it reached those centers, it is impossible to say without examining the cord. These cases are becoming more and more frequent, and in spite of the very best service that can be rendered them, they continue as a monument to what we do not know about neurology.

Dr. W. J. Mayo of Rochester, Minn.—I feel very much interested in Dr. Fairchild's paper. It brings to our minds, as Dr. Hodges has said, the fact that the surgery of the nervous system, taken as a whole, is the most unsatisfactory of all the different departments of operative surgery. I have seen a few cases such as the Doctor described in the first part of the paper, namely, the convulsive type, and very little benefit resulted from treatment. My brother, Dr. C. H. Mayo, has resected and reunited portions of the musculospiral nerve in three cases. These cases were the result of fracture of the humerus; power came on slowly, sensation returned promptly and remained. In the cases of direct incision, which I recall, in which the nerves were sutured at once, the results have been fairly good. In one case wherein the median and ulnar nerves were completely cut across, the results were excellent after primary suture.

I have seen two cases of typic paralysis agitans following injuries of the upper extremity—one a blow just below the shoulder, and the other a wound in the hand. The case the

Doctor describes at some length is an interesting one. It probably would not come under the head of paralysis agitans, although the convulsive movements may have been the same as those described by Hughlings Jackson. I recall another case in which the great sciatic was divided. In this instance there was some return of sensation three months after secondary suture, but not much motion.

I recall a number of cases in which amputation neuromata developed, and in which operation was made not only once, but several times. I know of but one instance where resection of the stump was followed by other than temporary relief, and if the patients are watched a sufficient length of time, this will usually be found true. One case we operated upon four times; the last time up to the cord, and the result was only temporarily beneficial. In most of these cases we must consider that there is an ascending neuritis, and if we bear in mind that every nerve-fiber has its origin in the central nervous system, and that each axis has a direct continuation from its origin to its point of supply, the particular fiber by the ascending neuritis may be affected clear to its origin. In this way we can explain the reason for such a large percentage of failures following operations on the nerves. In the cases where we have signs of degeneration of the nerve-fibers, the successes are small indeed.

Dr. W. W. GRANT of Denver.—This paper is certainly worthy of serious consideration, for several reasons. A simple uncomplicated case in surgery requires little at our hands; but cases of the kind reported are exceptionally complex; they are difficult to cure, and hence are always worthy of serious consideration, not only in showing what we do not know, but in stimulating us to try and improve in our methods of treatment. There is no class of cases more interesting than those of peripheral nerve injuries in their after effects. One of the significant things in the cases reported by Dr. Fairchild, is the absolute failure of the surgical methods employed to cure them. And one other matter which seems to me worthy of consideration is that the disease has been regarded entirely as local in its pathology and has been treated locally. Are there not in some of these inveterate cases constitutional conditions preceding the injury—conditions which materially influence their character

and their subsequent progress. Some of them are syphilitic; some of them may be tuberculous. These constitutional vices interfere very materially with the success of operative measures, and while I do not say this phase of the subject was not fully considered by the author of the paper, yet it has not been alluded to sufficiently to make a complete history of the cases. The cases reported by Dr. Fairchild are so instructive in themselves that, even as they are, the Doctor deserves very great credit for the able manner in which he has presented them. I would simply suggest that constitutional measures be added to the local in the treatment of these cases, and if this had been done in the cases reported, different results might have been obtained.

Dr. R. HARVEY REED of Rock Springs, Wyo.—I was very much interested in Dr. Fairchild's paper. It is an excellent contribution to this subject. Indeed, it is excellent in more ways than one. It is excellent because it shows the persistency with which the Doctor has followed out a certain injury with the object of giving relief; and it is interesting from the fact that he did not obtain relief after giving the patient the very best operative treatment that is known at the present day. Whether or not he could have pursued a better course remains a mystery, but I do believe, as has been said by Dr. Grant, that many cases come to us with constitutional contamination, and we can not obtain the same results from the same operations in those cases, or in the same class of injuries, that we do in others. This may have been true in the case of Dr. Fairchild. Of late years I have made it a habit, in cases where I have occasion to sever a nerve, of cutting the proximal end V-shape, so that the neurolemma would cover the nerve-fibers and give it plenty of flap, as it were, and I find that I do not have such trouble with neuromas as I had when I cut the nerve off at a right angle. I think, however, that in some of these cases we may obtain beneficial results by implantation. I have made a number of implantations of nerves after the Galbraith method, in which I have certainly obtained very satisfactory results. Where I am located at present we have a great many injuries to the nerves, and I have had occasion to make a great many implantations and nerve suturings. I find that there is a certain class of cases which

behave just as the Doctor described, and which we believe to be tainted with syphilis, or due to some other constitutional condition with which we are not familiar at the time. Why it is, I have not well satisfied myself as yet, except where I can ascertain from treatment that they respond to syphilitic preparations. In this class of cases we derive no benefit from implantation.

I do not wish to take up further time, but I simply desire to thank the Doctor for presenting his interesting paper, which is of value to all of us, and I think worthy of our trip here. I am quite sure that I have been amply repaid for coming here and listening to it.

Dr. FAIRCHILD (closing the discussion)—I am very grateful to the Fellows of the Academy for the courteous manner in which they have received my contribution. There was no attempt on my part to deliver an exhaustive dissertation upon the subject, but merely to give you a suggestive paper. There were two points particularly that I was anxious to dwell upon, and one was the question of implantation or any operative procedure for the purpose of restoring the nerve when there was a large amount of scar tissue present. In many of these cases of railroad accidents to the arm or to other parts of the body, there is an extensive laceration of soft tissues, and when healing takes place the wound is filled in with a large amount of scar tissue. My experience has been that any operative treatment on nerves in these cases is followed by absolute failure. I do not remember any successful cases following operative interference. Where you have a nerve divided without the probability of extensive scar tissue forming, then you may get some results from union of the nerve.

Dr. GRANT—Have you operated in any of those cases after infliction of the injury?

Dr. FAIRCHILD—I have waited usually until the wound has healed, because I want to operate through clean tissues. But the reason, it seems to me, was not so much the condition of the nerve below the point of injury as it was the extensive development of scar tissue which followed the operation at the point where the union of the nerve was accomplished. If we cut down on a nerve and remove a considerable amount of scar tissue, join the nerve, and leave the nerve short, in a short time

the scar tissue is reproduced, and the nerve is the same as before. If you make the operation where the soft parts have not been lacerated, and where the probability of getting a dense scar is not great, then you can get good results from suturing the nerve, or if the nerve can be drawn from outside the scar tissue to avoid proliferation.

The method of which Dr. Reed speaks, with reference to joining the nerves according to the Galbraith method, could not, I think, be adopted in a case of this kind. The case of injury to the musculospiral nerve, which recovered, was one where there was no serious injury inflicted to the nerve. The nerve had suffered contusion, and the electric stimulation showed the absence of the reaction of degeneration. The nerve below had not undergone extensive degenerative changes, and this patient got well. The case of the man that has been interesting to me and has given me a great deal of trouble, is a patient that does not suffer from any symptoms or indications of syphilitic infection. Indeed, there is no history of any syphilitic infection whatever. He is a man of simple habits; has lived in a small country village, and is entirely free, so far as the history shows, from syphilitic disease, and yet it may be possible. He has been under the treatment of iodid of potassium, but not in large doses. The case appeared to be one primarily of irritation of the ends of the nerve due to the contraction of the scar, or of catching of the nerves in the scar, and the degeneration traveled up the nerve to a point in the central nervous apparatus, as I have shown by the symptoms. I regret now that I did not make a more extensive operation at the beginning. If I had done so, I have no doubt I could have removed that part of the nerve which was involved in the scar entirely, and might have avoided much of the trouble the man has had. Yet, of course, this is uncertain.

There is one class of nerve injuries which I consider extremely important to railroad companies, because of their medicolegal relations, and that is injuries to nerve-fibers that do not give rise to any positive symptoms. A short time since I had occasion to examine a case of that kind, and there are many opportunities of being deceived and imposed upon by persons who are not entitled to consideration. The Doctor is

in great danger of being imposed upon by individuals who are not entitled to any consideration whatever. When a patient indicates the seat of pain, following definitely the distribution of nerves, I believe that the pain and symptoms he complains of are genuine. I do not think the average uninformed individual can point out the line which the nerve takes, or can map out the anatomic distribution of nerves. I had a case some time ago in which the individual outlined very definitely the course of the iliohypogastric nerve, and it was alleged that the man was a malingerer because no objective symptoms could be found. This man had not been under any instruction whatever, yet he followed definitely the course of this nerve. A man whom I examined yesterday indicated exactly the distribution of the sixth and seventh intercostal nerves of the right side. Just as soon as he got from one side to the other he claimed that he suffered no pain or tenderness. When a patient comes to me complaining of definite symptoms and follows the anatomic distribution of nerves, he has my confidence.

CONVENIENT FIRST DRESSINGS IN LEG FRACTURES.

BY EDWARD H. TRICKLE, M.D.
SURGEON T. & O. C. EXT. R. R. CO.
CUTLER, OHIO.

While my surgical experience only dates back thirty years, my observation of the management of leg fractures extends over half a century. When but a boy of 10 years of age, my brother had his leg broken below the knee while wrestling. The village doctor was called. He inspected the leg and sent me to bring him seven yards of calico. He tore off one strip for a bandage, split a shingle in two or three pieces, laid them around the leg and rolled the calico bandage around the sticks and directed the family to keep it wet with cold water. With every movement of the body my brother would howl with pain. After a long time he got around with crutches and finally walked, but his leg was badly crooked. Fortunately, a few years later he sustained another fracture of the same leg, and the surgeon in attendance kept it upon a patent posterior wooden splint and straightened it out. Since that time I have never taken kindly to splints, bandages or fracture-boxes.

It may be supposed that at this late day the old custom of splitting shingles or yanking palings off the fence to use as splints for fractures is obsolete, but less than ten years ago I was called in consulta-

tion to see a fracture case, and found the leg held in line by broken sticks, the splintered ends of which projected beyond the bandage at the foot and knee. It was hot weather, and the leg thus dressed had for three weeks been kept in soak, so that the stench was intolerable, while maggots were disporting themselves in the old bits of quilt or comfort packed around the leg in the box. There was no union. I cleaned up the leg, put a firm plaster case around it and told the man to get up and walk on it. He did so, and in time thus brought about consolidation. There can be no possible excuse for such poverty of resource or such criminal neglect of the simplest rules of hygiene.

We now find upon the market a great variety of fracture appliances; coaptation splints that fit the normal contour of the leg—posterior. anterior or lateral, as we may wish. All of them are useful in their way; some of them quite ornamental. We appreciate them, but it is our right and duty to improve on them if not entirely satisfactory. My objection to any splint is that it requires a bandage to hold it coapted to the leg. A fractured leg, if dressed immediately, will always swell more or less, and this subjects us to another call for the purpose of removing and reapplying the bandage. If this occurs and we fail in attention, the patient suffers, and irreparable damage may result. Splints and bandages are for this reason unsatisfactory, and I have discarded them, and have gone—not back to the old fracture-box—but forward to the newer conception of one that fits the leg like a stocking, and floats suspended a few inches above the bed instead of resting upon it.

How is this fracture-box made and of what material?

It can be made over the leg at the time of the first dressing, as follows: After the leg is properly cleansed and rendered aseptic, it is enveloped in surgeon's cotton and suspended in cheese-cloth, which adapts itself to the lower and lateral contour of the leg. Two strips of half-inch poplar board, shaped to fit the anterior contour, are clamped in against the sides of the muslin until they meet, thus closing the cloth around the leg like a stocking. The clamps resting on the instep, along the shin and in over the knee, are fastened together by bolts. Extension is made and maintained while plaster of Paris is applied sufficient to make a firm case. This may be done by passing the plaster bandage in roller form back and forth along the leg, or by strips of muslin saturated with the plaster cream laid on and smoothed down with the hand until the requisite thickness is obtained. It sets in ten or fifteen minutes, during which time extension must be maintained. The clamps are then removed the muslin trimmed at the top and about two inches of it turned outward and downward over the sides of the case. The leg thus cased is again suspended in cheese-cloth and clamped in at the top to maintain its coaptation to the leg until it is convenient to lace it with rubber cord, as you see in the sample before you.

The dressing thus applied is perfectly conformed to the leg, is open at the top, can be drawn apart for inspection, and when suspended moves when the body moves, causing no disturbance at the seat of fracture; yields sufficiently to accommodate swelling, and its alignment is maintained by the clamp, even though the case be light and fragile. I can not claim for this manner of "first dressing" any advantage over

the ordinary apparatus in the way of convenience, but we avoid the later *in*convenience of having to go back and readjust the bandages on account of swelling.

I now invite your attention to a "Normal Contour Fracture-Box" made of different material. It can not be made over the broken leg, but is molded over a plaster cast of the human leg. It is composed of screen-wire, cheese-cloth and a combination of adhesives which fill the meshes of the cloth and wire, and when dried make a hard, firm case, which retains the form into which it is molded, but is so pliant as to permit of being drawn apart for the reception or removal of the leg at our pleasure. A set or two of these prepared cases—rights and lefts—are, like Mrs. Toodle's coffin, "handy things to have about the house," and when we are called to a case of fracture, all we have to do is to police the leg, lay it in the case, lace it up and suspend it; we can then take our leave feeling that our patient will rest in comfort and safety. As you will observe, these prepared cases are light, sufficiently firm, exactly fit every part of the leg, preserve the normal alignment of the bones, and by their gentle embrace invite repose of all sore parts that may incline to distortion by spasmodic muscular contraction. The malleoli and condyles are embraced; the calf and heel rest in depressions exactly fitting their normal contour and thus maintain extension on the principle of the double inclined plane, the heel, calf and lower third of the thigh lying in depressions. When tired of lying on his back the patient can, after the first nine days, lower the suspension apparatus and turn on his side, letting the leg rest on the bed, and I doubt if there would be disturbance of the

fragments even should he throw the other leg over it. Should the fracture be compound, an opening can be made in the case for observation and dressing, but as the case spreads apart so easily, I prefer lifting it out by its cheese-cloth envelope for more thorough inspection and cleansing.

The anterior splint, composed of the same material as the case and exactly fitting all the normal curves of the leg, is two inches wide and fills the gap in front. The lacing passes back and forth over this, and, however tightly drawn, makes no impression on the circulation beneath. You will observe that the case is open clear down to the heel. This is to enable the leg to be lowered into its bed without letting up on extension until the calf and heel are imbedded and the case coapted to the leg. The foot-rest, of like material, is also molded to the normal curves of the foot, and can be fastened on or removed at pleasure.

In conclusion, let me say that the comfort and welfare of a patient with a broken leg should always receive our kindest consideration. Our thought, like an X-ray, should penetrate and unmask all abnormal conditions, and our effort should be to promptly adopt such remedial measures as the case may require. The dressing I have presented here is not perfect; but if it should be regarded as an improvement on existing methods, it shall be my endeavor to still further advance the lines toward my conception of a perfect "Normal Contour Fracture-Box."

Of the suspension apparatus, it is needless to speak. Each surgeon contrives his own. The necessity for suspension everyone must realize when we consider

that a lateral motion of the hips can not be made without strain at the seat of fracture, and immobility of the malleoli and condyles which project does not insure against mobility of the fragments, enveloped as they are by the soft parts. Fixation at the knee and ankle by a fracture-box lying on the bed implies at least lateral fixation of the hips; otherwise there will be pain and mischief. Suspension, allowing, as it does, the leg to float freely with any movement of the body, is a safeguard against pain and injury from this cause. The old-time method of boxing and soaking the leg forcibly suggests Hamlet's idea of death: "To lie in cold obstruction and to rot." Then amputation in compound fractures was the rule rather than the exception. Now, with our antiseptic methods and abundant supply of scientific appliances, we approach such cases with a consciousness of mastery.

CHAPTER IV.—EXECUTIVE SESSION.

Proceedings of the Fifth Annual Meeting

OF THE

AMERICAN ACADEMY OF RAILWAY SURGEONS

FIRST DAY—MORNING SESSION.

The Academy convened at the rooms of the Chicago Medical Society in the city of Chicago at 10:30 o'clock, Oct. 5, 1898, with Dr. R. HARVEY REED, president, in the chair.

The secretary, Dr. D. C. BRYANT, being absent, Dr. D. S. FAIRCHILD was on motion, elected secretary *pro tem.*

On motion, the reading of the minutes of the last meeting was dispensed with, as the same were printed in the Transactions already issued.

The report of Dr. F. J. HODGES, as editor, was deferred on account of absence.

The secretary being absent, the reading of his report was deferred.

A letter, with enclosures, from Dr. C. B. KIBLER, regretting his inability to be present, was read. His report as treasurer was then presented, as follows:

To the Fellows of the American Academy of Railway Surgeons:

The treasurer begs to report that he has received, dues and membership fees, since last report.	$295.00
Balance on hand at last report	225.15
Total	$520.15
Credit by cash, as per vouchers approved by Executive Committee.	240.44
Balance on hand . . .	$279.71

Most respectfully submitted,

C. B. KIBLER, Treasurer.

On motion, said report was accepted.

There being but two members of the executive board present, viz., Drs. F. K. AINSWORTH and MILTON JAY, the president appointed Drs. EDWARD DOOLEY and E. C. CARR to act temporarily as members of said board.

Dr. MILTON JAY, chairman of the Committee of Arrangements, reported that the place of meeting had been changed from the Auditorium Hotel to the rooms of the Chicago Medical Society, by reason of a courteous invitation to do so by the officers of said society.

Dr. R. HARVEY REED offered the following resolutions, which were, on motion, adopted:

WHEREAS, The roll of membership is greatly in need of revision, owing to changes of various kinds, in addition to deaths, therefore be it

Resolved, That the secretary and treasurer be and are hereby constituted as a special committee for this purpose. Further, that they are authorized to make revision of said Roll of Fellows as follows:

First: To indicate by an asterisk those who have died from the organization of the academy up to date, and prepare and insert suitable memoriams of all those who have not already been recognized in this way for publication in the next proceedings.

Second: To eliminate from the roll of active members all those who have severed their connections with all railroads, and in accordance with the constitution, place them under the head of honorary members.

Third: To carefully correct the addresses, together with the roads with which they are connected, and see that their proper address and road appear in the next volume of our Transactions.

Fourth: To further eliminate all delinquents in accordance with the constitution and drop them from the roll of membership.

Very respectfully submitted.

Dr. R. HARVEY REED, chairman of the Committee on Publication, made his report and moved "that the academy continue to publish its papers in the JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, and also continue to publish the volume of Transactions."

Objections thereto being raised, Dr. F. J. HODGES moved as an amendment "that a new contract be made with the said JOURNAL, providing for the earlier publication of papers."

Dr. EDWARD DOOLEY moved as an amendment "that if a Fellow desired to publish his paper in some other journal he shall so notify the chairman of Committee on Publication."

Dr. W. J. MAYO moved to add to the amendment offered by Dr. Dooley, "and he shall have the right to publish in other journals."

Dr. H. REINEKING moved that the entire matter of publication be laid over until the afternoon session. The same was seconded and carried.

The editor's report was referred to the Executive Committee.

On motion of Dr. W. J. MAYO, the reading of papers was postponed until the afternoon session.

Dr. JAY, chairman of the Executive Committee, made a report for the said committee.

The secretary presented letters from Drs. Lester Hall, F. D. Barker, R. H. Taylor, C. B. Parker and R. D. Mussey, which on motion were accepted and their names ordered dropped from the Roll of Fellows.

Letters of resignation as *active Fellows* from Drs. W. H. Meyer, C. P. Thomas and F. H. Peck were read; on motion the same were accepted and each elected to *honorary fellowship*.

Dr. W. H. ELLIOTT, whose resignation was accepted at the last meeting, was, on motion, elected to *honorary fellowship* and the secretary was instructed to notify him of such action.

On motion the academy adjourned until 2:30 P.M.

FIRST DAY—AFTERNOON SESSION.

The academy was called to order by the president.

The chairman of the Committee on Publication presented a substitute motion in lieu of those considered at the morning session, which on motion was adopted, and was as follows:

It was moved and seconded that the choice of a publisher of the Transactions be left to the discretion of the Publication Committee, subject to the financial resources of the academy, and that the Fellows be allowed to publish their papers in the periodical of their choice, providing that if it be not in the official organ of the academy, the Fellow to notify the editor and personally defray the expense of setting his paper in type for the academy's Transactions.

The reading of papers was then announced, in accordance with action taken thereon at morning session.

The reading of the paper of Dr. H. HATCH on "Conservatism in Railway Surgery" was, owing to his absence, deferred till a later hour.

Dr. D. S. FAIRCHILD presented a paper on "Traumatic Injuries to the Peripheral Nerves." Discussion followed.

Dr. H. REINEKING read a paper on "Concealed Meningeal Hemorrhage." Discussion followed.

Dr. W. J. MAYO then read a paper entitled "The Radical Cure of Hernia." Discussion followed.

Owing to the continued absence of Dr. Hatch, his paper was read by title and referred to the Committee on Publication.

On motion, the reading of the minutes of the day's sessions was postponed.

On motion, seconded and carried, the academy adjourned until 9:30 to-morrow (Thursday) morning.

D. S. FAIRCHILD, Sec. pro tem.

SECOND DAY—MORNING SESSION.

The academy was called to order by the president.

The president appointed Drs. C. S. Baldwin, Edward Dooley and F. K. Ainsworth as a Nominating Committee.

A resolution was offered by Dr. W. W. GRANT to limit the next annual meeting to a two-days session, unless the work presented necessitated a three-days session. The same was seconded and carried.

On motion of Dr. F. J. Hodges, which was seconded and carried, it was decided to elect officers by nomination by Fellows and ballot.

The secretary then presented applications for Fellowship from:

Dr. J. C. Hammond, Surgeon U. P. Ry., Hannah, Wyo.

Dr. A. E. Ellinwood, Surgeon Erie Ry., Attica, N. Y.

Dr. Wm. J. Fairfield, Chief Surgeon C. & S. E. Ry.

Dr. Wm. Ruml, District Surgeon C. & N. W. Ry., Cedar Rapids, Iowa.

Dr. Alex. J. Stone, Surgeon C. M. & St. P. Ry., Minneapolis, Minn.

The reading of papers was then resumed.

Dr. MILTON JAY presented a paper on "Fracture of the Patella." Discussed by Drs. W. W. Grant, F. J. Hodges and W. J. Mayo, and closed by Dr. Jay.

Dr. J. F. PRITCHARD then read a paper entitled "Physical Examination for Railway Service." Discussion by Drs. T. B.

Lacey, W. L. Smith, D. S. Fairchild, M. Gardner and D. C. Bryant; closed by Dr. Pritchard.

On motion, the academy adjourned till 2:30 P.M.

SECOND DAY—AFTERNOON SESSION.

The academy was called to order at 2:30 by the president.

A ballot was now had on the applications for Fellowship, of Drs. J. C. Hammond, A. E. Ellinwood, W. J. Fairfield, Wm. Ruml and Alex. J. Stone, with the result that each was elected to Fellowship in this academy.

Dr. T. B. LACY offered the following amendments to the constitution:

1. To strike out the words *two hundred* in the fourth line of paragraph one of section three.
2. To strike out entire *first, second* and *third* lines, and first two words in fourth line of paragraph two of section three.

Dr. J. P. LORD offered the following amendment to the By-Laws:

To strike out the word *five* in the first line of section six, and insert, in lieu thereof, the word *three*.

Under the rules, each of the above amendments was laid over until the next annual meeting.

The election of officers for the ensuing year was taken up, with the following result:

President—Dr. W. W. Grant of Denver, Colo.

First Vice-President—Dr. J. F. Pritchard of Manitowoc, Wis.

Second Vice-President—Dr. J. P. Lord of Omaha, Neb.

Secretary—Dr. T. B. Lacy of Council Bluffs, Iowa.

Treasurer—Dr. C. B. Kibler of Corry, Pa.

Editor—Dr. F. J. Hodges of Ashland, Wis.

Member Executive Board—Dr. D. S. Fairchild of Clinton, Ia.

The academy then passed from Executive Session, and the reading of papers continued.

The president read his address entitled, "The Higher the Order of Railway Surgery the Greater the Protection to the Employe, the Passenger and the Company."

In addition to the regular program a voluntary paper entitled, "Anesthetics, with Special Reference to Schleich's Mixture," was presented by Dr. S. C. Baldwin of Salt Lake City, Utah. Discussed by Drs. J. P. Lord, H. Reineking, W. J. Mayo, Fred J. Hodges, and closed by Dr. Baldwin.

Dr. E. H. TRICKLE read a paper entitled "Convenient First Dressings for Leg Fractures," and exhibited samples of same. Discussed by Drs. T. B. Lacy and W. W. Grant, and closed by Dr. Trickle.

On motion, the academy adjourned till 10 o'clock tomorrow (Friday) morning.

THIRD DAY—MORNING SESSION.

The academy convened pursuant to adjournment, and was called to order by the president.

A voluntary paper entitled, "The Personal Equation in Railroad Accidents," was presented by Dr. Norman Bridge of Chicago.

Drs. W. W. Grant, F. J. Hodges, T. B. Lacy, R. Harvey Reed, J. P. Lord and E. H. Trickle participated in the discussion, which was closed by Dr. Bridge. On motion, the paper was referred to the Executive Committee for publication in the Transactions.

On motion, the thanks of the academy were voted to the Chicago Medical Society for the use of their rooms.

The president-elect, Dr. W. W. Grant, was escorted to the chair and formally introduced to the academy, whereupon he assumed the duties of his office.

The president appointed Drs. J. P. Lord, T. B. Lacy and F. J. Hodges as the Committee on Arrangements for the next session.

On motion, the academy decided to hold its next annual meeting at Omaha, Neb., in October, 1899, the date of meeting to be determined by the Executive Committee.

On motion, seconded and carried, the academy stood permanently adjourned.

T. B. LACY, Secretary.

CONSTITUTION AND BY-LAWS

OF THE

AMERICAN ACADEMY OF RAILWAY SURGEONS

Adopted at Chicago November 9, 1894, and as Amended September 25, 1896.

NAME.

1. The name of this organization shall be "The American Academy of Railway Surgeons."

OBJECTS.

2. The objects of this Academy shall be the improvement and advancement of Railway Surgery by means of the study of the subject in general, and especially by the study and investigation of Clinical, Medico Legal and Sanitary matters relating thereto, by the reading and discussion of papers in convention; and the cultivation of closer fraternal relations amongst those actively engaged in this special work.

MEMBERSHIP.

3. The members of this organization shall be known as "Fellows," and shall be divided into two classes, namely, "Active" and "Honorary." The list of Active Fellows shall be limited to two hundred (200) Railway Surgeons and shall be restricted to those in actual service as such at the time of their election.

No Fellow shall continue as an Active Fellow after having severed his connection with a railway company, but he may become an Honorary Fellow by a vote of the Academy, as herein provided. Honorary Fellows shall have the same privileges as Active Fellows, excepting the right to vote, hold office, and participate in the Executive Sessions.

The list of Honorary Fellows shall at no time exceed one hundred (100), and shall be composed of such Surgeons and

Physicians, and reputable members of allied professions, as may be elected at any regular meeting by a two-thirds (⅔) vote of the Academy, provided that after the year 1894 not more than five (5) Honorary Fellows shall be elected at any annual meeting.

PENALTIES.

4. Upon a sufficient showing that a Fellow has been wilfully guilty of gross violation of the laws governing the Academy, or any form of professional misconduct, the Executive Board may recommend that his resignation be requested, or move his suspension or expulsion; a majority vote of the Fellows present at an Executive Session being necessary to fix the penalty.

OFFICERS.

5. The officers of the Academy shall consist of—

A President,
Two Vice-Presidents,
A Secretary,
A Treasurer,
An Editor,
An Executive Board of seven (7), including the President, the Secretary and the Treasurer, who shall be *ex-officio* members thereof.

ELECTIONS.

6. Applications for Fellowship shall be made in writing to the Executive Board, signed by three (3) Active Fellows who are personally acquainted with the candidate. Upon a favorable report by the Executive Board, a ballot shall be ordered, when, if not more than three (3) negative votes appear, the candidate shall be declared elected.

The officers of the Academy shall be elected on the last day of each Annual Session by ballot; a majority vote of the Fellows present being necessary to a choice.

MEETING.

7. The Annual Session of the Academy shall be held at such time and place as shall be designated by a majority vote at the previous Annual Session; and each session shall continue for three (3) days, unless otherwise ordered by the Academy.

An Executive Session for the transaction of business shall be held on the morning of the first day of each Annual Session, none but active Fellows of the Academy being present.

BY-LAWS AND RULES OF ORDER.

1. The President shall preside at all regular meetings of the Academy, sign all official documents, and perform the ordinary duties appertaining to his office. In his absence one of the Vice-Presidents shall occupy the chair, in the order of seniority; or, if both of them are absent, a Fellow elected by the Academy.

The Secretary shall keep a correct record of the proceedings of the Academy, give notice of the time and place of all meetings, receive the signatures of Fellows, sign official documents and take charge of all property of the Academy not otherwise provided for.

The Treasurer shall receive all money paid into the Academy, and disburse it upon the authorized order of the President and Secretary. He shall make a full report, and his accounts shall be audited by a select committee appointed for that purpose at each Annual Session.

The dutes of the Editor shall be those ordinarily pertaining to such an office. He shall edit all the papers and discussions, and see that they are published as directed by the Academy. He shall act as a member of the Publication Committee, consult with said committee regarding the publication or exclusion of any paper or discussion submitted to him for publication, and assist in securing papers for each annual meeting, and the proper arrangement of the same on the program, and such other duties as may be assigned him by the Committee on Publication.

EXECUTIVE BOARD.

2. At the Annual Session of the Academy in 1894, four Fellows of the Executive Board shall be elected—one to serve one year, one to serve two years, one to serve three years, and one to serve four years; at each Annual Session thereafter one member of the Executive Board shall be elected to serve four years. The functions of the Executive Board shall be both judicial and executive; it shall have the general supervision of

the affairs of the Academy; it shall recommend candidates for membership in the Academy, and it alone shall have power of moving their expulsion or suspension for any alleged offense against the Constitution or By-Laws. It shall act as a Committee on Credentials, hold any necessary meetings in the interval between sessions, and its action shall be deemed the action of the Academy, unless reversed by that body.

COMMITTEES.

3. *Committee on Transportation.*—At each Annual Session the President shall appoint a Committee on Transportation, consisting of three (3) Fellows. It shall be the duty of this committee, as far as possible, to arrange with the various railway companies for the transportation of the Fellows of the Academy to and from the Annual Session. They shall cause the publication of a list of railways granting transportation, and other necessary information.

Committee on Publication.—The President, Secretary, Treasurer and Editor shall constitute a Committee on Publication, to which shall be referred all papers, reports and other matter suitable for publication by the Academy.

Committee of Arrangements.—A Committee of Arrangements, consisting of three (3) Fellows, shall be appointed by the President at each Annual Session, the chairman of which shall reside in the place where the next Annual Session is to be held. This committee shall confer with the Committee on Publication in the preparation of the program for the next Annual Session, a copy of which shall always be sent to each Fellow at least one month before the opening of the Session; and shall make all necessary preparation for the meeting of the Academy.

SCIENTIFIC WORK.

4. The Scientific Work of the Academy shall be divided into
   1. Surgical,
   2. Medico-Legal,
   3. Sanitary.

All papers and reports of discussions shall become the exclusive property of the Academy, subject to such disposition as shall be ordered by the Committee on Publication.

MEMBERSHIP FEE.

5. The admission fee shall be five ($5.00) dollars, to be paid when the application is made. Should an applicant fail of election, this fee shall be returned to him.

DUES.

6. The annual dues shall be five ($5.00) dollars, payable on or before the last day of the annual meeting. Neglect or failure on the part of any Fellow to pay his dues shall forfeit his right to vote or receive the perquisites of the Academy until his dues are paid; and failure to pay his dues in thirty (30) days after the annual meeting shall forfeit his Fellowship.

QUORUM.

7. Any number of Fellows present at the appointed time of the Annual Session shall constitute a quorum for the transaction of ordinary business; but for the election or expulsion of Fellows or for altering the Constitution or By-Laws, twenty-five (25) Fellows shall be required to form a quorum.

ORDER OF BUSINESS.

8. 1. Call to Order.
2. Addresses or other special exercises as prepared by the Committee of Arrangements.
3. Reading Minutes of Previous Meeting.
4. Reports of Officers and Committees.
5. Miscellaneous Business.
6. Announcements.
7. Reading Reports of Cases and Exhibitions of Patients, Specimens, Apparatus, etc.
8. Reading and Discussion of Papers.
9. Unfinished Business.
10. Election.

RULES.

9. Roberts' Rules of Order shall govern the deliberations of the Academy.

AMENDMENTS.

10. Proposed amendments to the Constitution and By-Laws must be offered in writing at a regular session, and shall not be acted upon until the next ensuing Annual Session, when a two-thirds (⅔) vote of the Fellows present shall be necessary to adopt.

OFFICIAL ROLL OF FELLOWS

OF THE

AMERICAN ACADEMY OF RAILWAY SURGEONS

Dr. David C. Ainey, Assistant Surgeon D. L. & W. R'y, New Milford, Pa.

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Dr. E. Wyllis Andrews, Surgeon Wabash R'y, Chicago.

Dr. W. W. Appley, Surgeon N. Y., L. E. & Western R'y, Cochecton, N. Y.

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Dr. S. C. Baldwin, Surgeon G. S. L. & H. S. R'y, Salt Lake City, Utah.

Dr. J. F. Bancroft, Chief Surgeon U. P. D. & G. R'y, Denver, Colo.

Dr. Amos Walker Barber, Surgeon U. P. D. & G. R'y, Cheyenne, Wyo.

Dr. Frederick D. Barker, Surgeon C. H. & D. R'y, Dayton, Ohio.

Dr. G. E. Benninghoff, Surgeon W. N. Y. & P. R'y, Bradford, Pa.

Dr. A. D. Bevan, Late Chief Surgeon Iowa Central R'y, Chicago.

Dr. W. T. Bishop, Medical Examiner Pennsylvania R'y, Harrisburg, Pa.

Dr. W. R. Blakeslee, Surgeon N.Y., L.E. & Western R'y, Forest City, Pa.

Dr. Eduard Boeckmann, Consulting Surgeon C. & G. W. R'y, St. Paul, Minn.

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Dr. Henry W. Coe, Surgeon East Side R'y, Portland, Ore.
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Dr. R. H. Cowan, Surgeon N. & W. R'y, Radford, Va.
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Dr. W. O. Daniels, Surgeon Georgia Penitentiary, Atlanta, Ga.
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Dr. J. G. Davis, Chief Surgeon L. N. A. & C. R'y, Chicago, Ill.
Dr. LeRoy Dibble, Surgeon C. R. I. & P. R'y, Kansas City, Mo.
Dr. N. F. Donaldson, Asst.-Surgeon U. P. R'y, North Platte, Neb.
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Dr. J. B. Eagleson, Division Surgeon Great Northern R'y, Seattle, Wash.
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Dr. Samuel Kennedy, Surgeon Big Four R'y, Shelbyville, Ind.
Dr. T. C. Kennedy, Surgeon Big Four R'y, Shelbyville, Ind.
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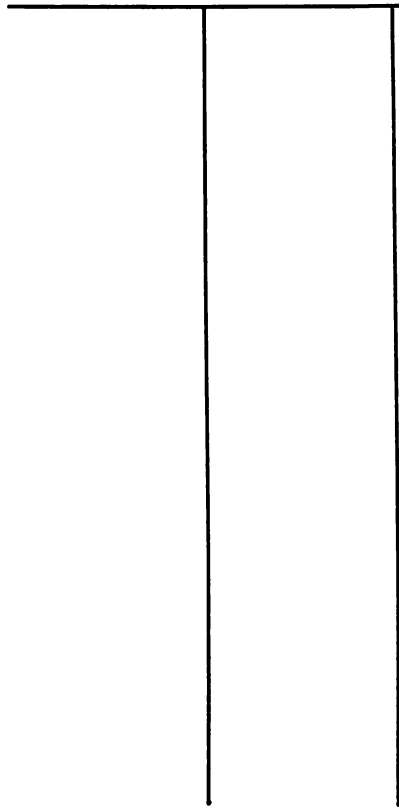

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